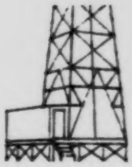
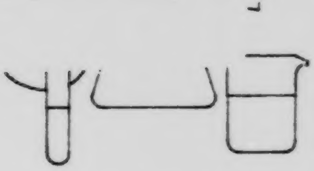
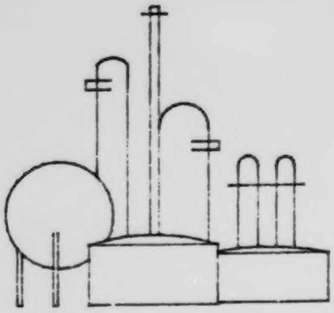






ENVIRONMENT CANADA

ENERGY RESEARCH AND DEVELOPMENT PROGRAMME

1987–88 ANNUAL REPORT

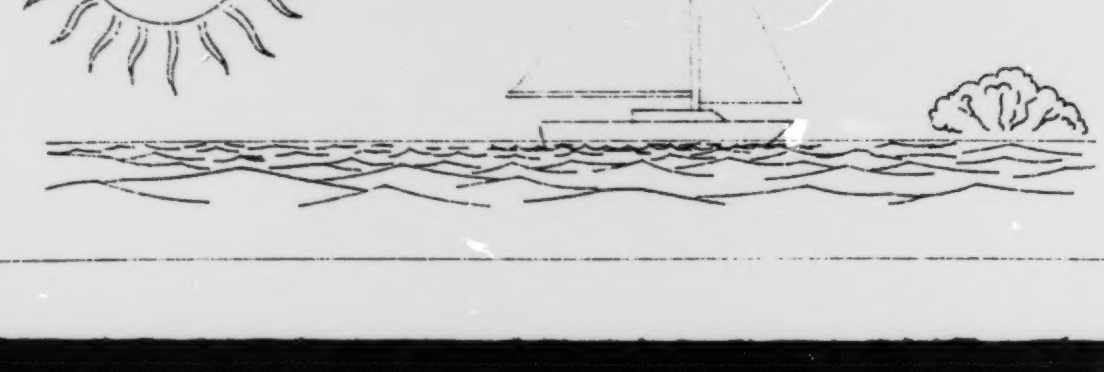
ENVIRONNEMENT CANADA

PROGRAMME ÉNERGÉTIQUE DE RECHERCHE ET DÉVELOPPEMENT

RAPPORT ANNUEL 1987–88

Corporate Policy Group
February, 1989

Service des politiques
du Ministère
février, 1989



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Environment Canada
Energy R&D Programme: 1987-88 Annual Report

Environnement Canada
Programme de R&D énergétiques: rapport annual 1987-88

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I SUMMARY:

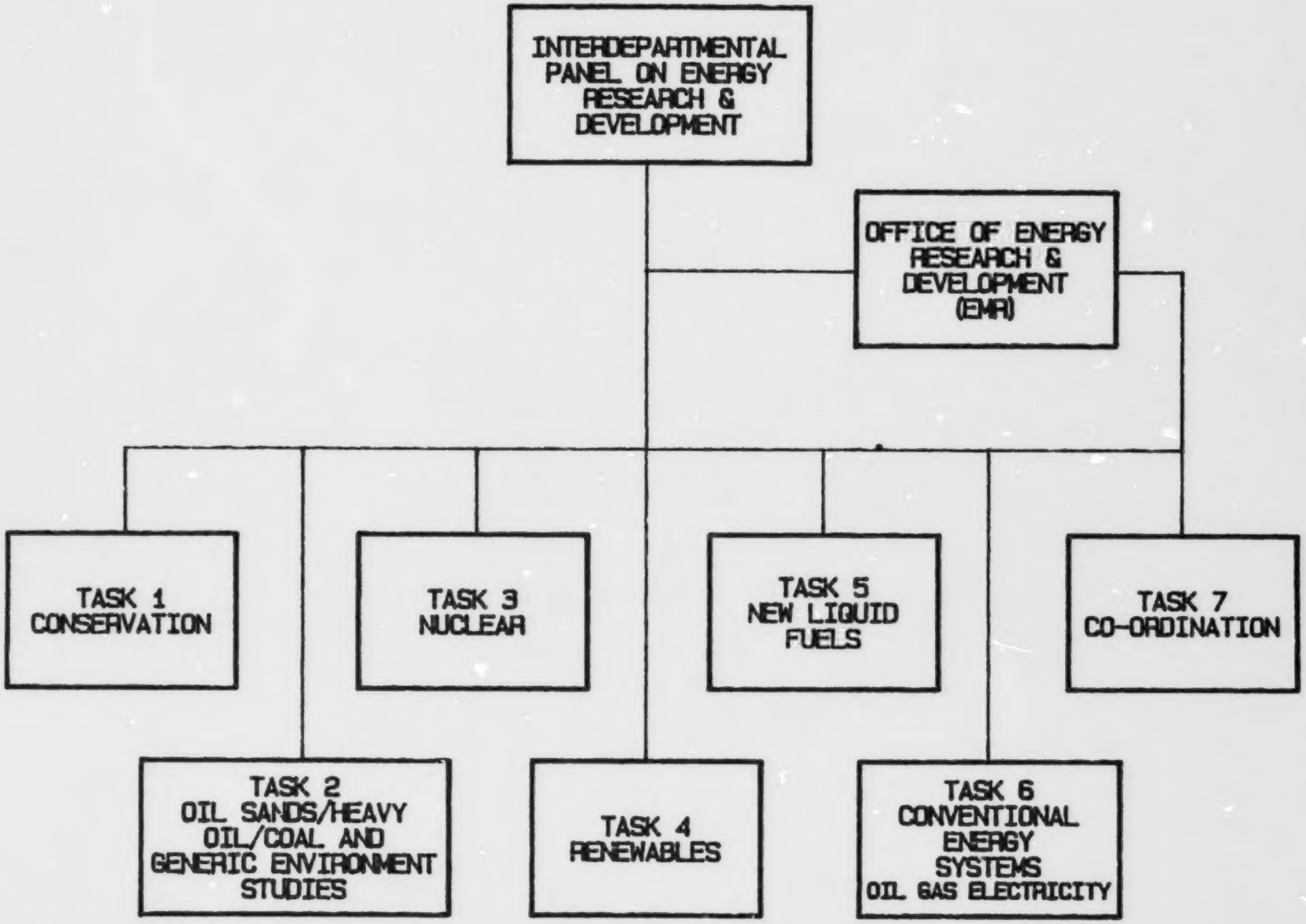
A) INTRODUCTION:

This report provides a detailed overview of Environment Canada's Energy Research and Development Programme associated with the interdepartmental Panel on Energy R&D (PERD). It only deals with the programmes directly associated with Panel resources and does not cover programmes such as oil spills (AMOP) and nuclear fission power. The financial/person-year disbursements for fiscal year 1987-88 were $23.8M and 63.9 PYs. A comprehensive summary is provided for each Service's resources, including annual reports for individual projects. The resources discussed include those provided by PERD ($6.5 M and 15 PYs), Environment Canada (EC) support ($8.8 M and 45.2Ys) and $8.6M provided from the industrial and provincial sectors and other federal funds (such as DSS UP). The amount of cost share support from outside the department has increased significantly over the last two years (figure 3).

About 68% of PERD and EC resources ($15.2 M) were contracted out in 1987-88. The PERD resources continue to provide a significant portion of the Department's total resources for R&D. These resources therefore play a major role in our priority areas of acid rain (ie. coal combustion control technology), toxic chemicals (ie. National Incinerator Testing and Evaluation Programme, oil-from-sewage-sludge project), climate change (ie. CO_2 Advisor), and human health & safety (Canadian Atlantic Storms Programme), while at the same time providing significant benefits to environmentally-sound energy development across Canada. The priority areas for federal energy R&D resources include: alternatives to gasoline (New Liquid Fuels); increased efficiency of energy use (conservation); new energy sources (Fusion, Renewables); and new technologies and processes for oil production (Western Basin, Canada Lands).

Figure 1 on the opposite page illustrates the PERD structure. PERD projects are funded through the six Tasks shown. The Tasks are comprised of committees which review proposals from participating Departments. The committee recommendations are forwarded annually to the Panel for approval.

FEDERAL ENERGY RESEARCH AND DEVELOPMENT CO-ORDINATING STRUCTURE


INTERDEPARTMENTAL PANEL ON ENERGY RESEARCH & DEVELOPMENT
OFFICE OF ENERGY RESEARCH & DEVELOPMENT (EMR)
TASK 1 CONSERVATION
TASK 2 OIL SANDS/HEAVY OIL/COAL AND GENERIC ENVIRONMENT STUDIES
TASK 3 NUCLEAR
TASK 4 RENEWABLES
TASK 5 NEW LIQUID FUELS
TASK 6 CONVENTIONAL ENERGY SYSTEMS OIL GAS ELECTRICITY
TASK 7 CO-ORDINATION

B) ENVIRONMENT CANADA ENERGY R & D PROGRAMME ACCOMPLISHMENTS 1987-88:

This section highlights some of the EC programme accomplishments during the fiscal year 1987-88. Details are provided in section II in the individual project reports (which also include project objectives, managers, contractors and publications). The numbers in [ ] brackets are the individual OERD project numbers.

i) ATMOSPHERIC ENVIRONMENT SERVICE (AES):

a) Generic - Carbon Dioxide Impacts

- Identified major pollution events for eastern Canada, and prepared meteorological data base in order to evaluate the capability of regional air pollution models to forecast high acid deposition episodes; forecast results to be used as a supplementary control system. [24307]

- Participated in organization of World Conference on the Changing Atmosphere, and in OECD workshop on climatic change; prepared and disseminated 1986 Annual report "Understanding CO_2 & Climate", and one issue of "CO_2/Climate report"; presented seminars to variety of students, researchers & policy makers. [25103]

- Made CO_2 flux measurements at Borden Forest, in support of improved understanding of global carbon cycle and CO_2/climate issue; used a simplified turbulent transfer method to generate estimates of CO_2 fluxes for days with southerly winds; measured gradient of temperature, water vapor and CO_2 concentrations for a 4 m height difference above the forest; tabulated and graphed data collected in 1987; made biomass heat storage measurements from June onwards using a scanning radiation thermometer. [25106]

b) Renewables

- Improvements to AES solar radiation model were made, changes include better handling of missing data and a new manual; IEA subtask (b) (Validation of Solar Modelling) final reports approved; subtasks (d), (e), (f) (Irradiance Measurement for Solar Collector Testing) initiated. [42102]

- Made improvements to the MF-MICRO model for wind flow in complex terrain; distributed MF-MICRO and a mainframe computer version of MS3JH/3R; prepared, for publication, four journal papers on the Askervein Hill study; continued support for CSA WECS standards (F428 - Site Assessment Guidelines) and IEA ANNEX VIII (handbook for decentralized WECS Applications). [46101]

c) Oil, Gas, Electricity

- Completed storm selection and model verification for extreme wind/wave hindcast on Grand Banks, Scotian Shelf and Georges Banks; produced a data base of hindcast storm winds for Beaufort Sea, used in COGLA's response/evaluation of Amauligak proposal; implemented spectral wind/wave hindcast model on micro-computer, to allow in-house storm hindcast capability; developed an analysis system for the estimation of wind statistics in data sparse Arctic locations; produced a new statistical analysis technique for computing wind gust over oceans and climatology. [62120]

-Completed study on the applicability of present environmental data bases on combined environmental extremes for calculation of loads on offshore structures; implemented statistical software for computation of extreme values in AES MAST climate analysis systems. [62121]

-Completed a combined environmental effects contract in support of offshore arctic engineering needs - (1st step in including AES archive in new CSA code); completed Canadian Beaufort Sea Marine Atlas, used in COGLA's response and evaluation of Gulf Canada's proposed Amauligak Production facility; Incorporated the Hudson Bay and the satellite microwave (SMMR) ice data bases into CRISP (sea ice analysis system) - (1st step in evaluating satellite derived climate data); completed a feasibility contract using the Climate Centre Archives in probabilistic ice-structure interaction modelling. [62322]

-Developed comprehensive vessel icing data set from review of Soviet marine icing research 1960-80; initiated development of improved icing model for the supply vessels; completed joint platform icing model evaluation project with NHL of Norway; carried out rig icing monitoring program on SEDCO 710 and attendant supply vessels; presented PERD-funded research at international conferences and workshops. [62323]

- Developed marine wind forecast equations for Canadian marine areas; thoroughly tested equations on the independent datasets, including CASP (Canadian Atlantic Storms Program). Results show this procedure to be a viable way of producing a good wind forecast for marine areas on the synoptic scale. [67101]

- Compared spectral and parametric wave models; results showed that the spectral wave model performs better than the Canadian operational products; EC, DND and DFO working group recommended that the ODGP model replace AES's operational model. Tested AES storm surge model on CASP datasets for Scotian shelf, Bay of Fundy and Gulf of Maine, results showed skill although no extreme events in the period. [67104]

-Software development, to process a limited volume of satellite radar data, has progressed to the point where the image preprocessing (enhancement) and image geocorrection subsystems have been functionally completed; hardware for Ice Data Integration and Analysis System (IDIAS) was purchased and installed; a number of small studies were completed in order to address particular IDIAS design problems. [67116]

- A communication system, baseband unit, that will permit high-quality and high-definition ice information to be transmitted reliably between ice reconnaissance aircraft and Ice Forecasting Central is 95% complete; ICEC demultiplexer has been completed. [67118]

- Completed software for processing laser profilometer data for the automatic derivation of ice ridging statistics. [67122]

- Developed a marine oil spill model capable of predicting the movement and spreading of oil in medium to high concentration ice cover; derived a new empirical formulation for the spreading of oil in ice; moved advanced AES oil spill model from a mainframe computer to an IBM PC system. [67126]

- Analysis of data gathered during CASP field experiment was continued at a joint CASP/GALE workshop held in Virginia. Comparisons were made between rapidly deepening and non-deepening storms, it was shown that few regions within any storms are characterized by deep convection; a conceptual model of CASP storms was presented to forecasters for improved forecasts into the operational environment; responded to numerous requests for CASP data from 5 Canadian universities and 6 U.S. research institutes and universities. [67135]

- Made software changes on Regional Ice Model for the operational forecasting of ice formation, movement and deterioration; completed model evaluation. [67142]

- Recovered WOTAN from Labrador Sea where it was used to determine overall average and calibration to wind speed during storms; prepared reports on WOTAN's instrument performance, and on use of satellite scatterometry for measuring winds at sea; re-engineered prototype buoy for oil mixing experiment. [67143]

- Organized workshop on the field phase of ERICA (Experiment on Rapidly Intensifying Cyclones-Atlantic). [67156]

- The chemical data base for COBRA, a unique model developed in Canada for hazard assessment regarding spills of toxic liquids and gases, was expanded to include 9 different chemicals. [67219]

- Provided support to the CEA and IEEE committees dealing with ice wind loads on transmission lines and towers; awarded contract for development of the prototype ice and wind loading model. [68203]

ii) CORPORATE POLICY GROUP:

a) General

- Published 1985/86 EC Annual report on Energy R&D, and series of Energy Notes on important topics on energy and environment; supported successful workshop on Environmental Effects Monitoring in the Offshore, and major international workshop on Incineration of Wastes and Ash Disposal; provided Lab support to C&P Atlantic for implementation of new offshore monitoring techniques. [25108]

b) Carbon Dioxide Impacts

- Organization for the Energy Workshop for the Changing Atmosphere Conference was completed. [25108]

c) Oil, Gas, Electricity

- Completed Planning for PERD 6.7 Committee workshop with the Canadian Petroleum Association. [25108]

iii) CONSERVATION AND PROTECTION (C&P):

a) Conservation/Recycling

- Eight projects with industry were concluded during 1987/88; work concentrated on developing hardware, techniques and systems to maximize opportunities for saving energy through waste reduction and recycling; six technical reports, on the economic recovery of waste products, are currently being reviewed for publication. [12201]

- Successfully operated the Canadian Waste Materials Exchange to insure increased recycling ; completed draft report for code of practice of used-oil; published four issues of "Resilog" promoting reduction /recycling. [122A1]

- Retrofitted Tillsonburg municipal wastewater treatment plant testing confirmed that aeration energy savings in the order of 10 to 35 %, depending upon plant operating configuration and dissolved oxygen setpoint level; technical exchange of results carried out with researchers from Sweden. [12202]

- Successfully completed testing of two-stage combustion system; 5000 copies of the NITEP Up-date newsletter were distributed to approximately 500 organizations and individuals; 2 semi-technical documentary film on technologies of the two-stage system and reduction of toxic emissions. [12203]

- An economic analysis of heat pump application for groundwood and kraft mills was carried out at selected mills to determine applicability to this industry on simulation process PAPMOD computer programme.

b) Oil Sands/Heavy Oil

- Held joint industry-government technical seminars at which results of the studies on deep well disposal in oil sands/heavy oil areas were presented and discussed; initiated contract to validate existing deep well monitoring data and evaluate the capability of the ARC model to predict effects from active oil sands/heavy oil wastewater injection wells; developed comprehensive mathematical model to describe all the relevant processes associated with the Underground Test Facility (UTF) operations. [24102]

- Performed experiments with decreased flow rate and coagulent dosage to examine the effects of retention time and dosage on filter performance for recycling of Tailings Pond Water; developed detailed design for agitation and upflow filtration experiments; performed economic feasibility analysis of filtration as compared to other options; developed process capable of disposing oily wastes in an environmentally acceptable manner; tested 17 different wastes at the bench scale test unit to determine the quantity of oil recovered; processed 400 tons of waste sludges in the 5 ton/hour pilot plant in order to provide scaled up data for selected wastes. [24104]

- Summary report on produced water characteristics from 20 heavy oil sites has been drafted; prepared draft reports on the bench scale field evaluation of granular media filtration; completed joint industry-government field trials on filtration and vapor compression evaporation (VCE); initiated in-house pilot scale work on cross flow microfiltration for removal of oil and suspended solids from produced waters. [24105]

- Research findings, to determine the potential for land treatment of heavy oil sludges and diesel invert-based drilling residues as an environmentally acceptable management practice, have had substantial influence on the content of Alberta's new draft guidelines. [24106]

c) Coal

- The effectiveness of duckweed and emergent aquatic plants in removing nitrogen compounds from coal mine wastewaters was determined; state of the art (BPT) environment protection equipment/practices in use at Canadian coal mines have been identified which enable operators to meet existing air, water and reclamation requirements. [24201]

- Completed preliminary work on furnace sorbent injection (FSI) waste characteristics and disposal procedures at Ontario Hydro's pilot plant; results will influence waste disposal requirements for Saskatchewan Power (SHAND), Ontario Hydro (Nanticoke) and New Brunswick Power (Dalhousie) FSI systems. [24303]

- Improved disposal procedures were demonstrated at the Chatham Fluidized Bed Combustion (FBC) unit disposal site for solid wastes generated during coal combustion; published "Wastewater Characteristics" report; the report indicates that relatively simple treatment options are available to eliminate toxicity of FBC wastewaters; completed National Hydrology Research Institute (NHRI) facility for indoor aquifier testing (FIAT). [24304]

- Completed work to ascertain and optimize parameters controlling neutralization of SO_2 in pilot scale furnace experiments, by use of calcium-based slurries; results indicated that the pollutant removal rates were directly related to Ca/S ratio and to a lesser extent to temperature at the point of injection, degree of atomization, and relative axial velocity of slurry droplets; developed model for predicting mathematical relationship between air flow, heat input, gas temperature and heat transfer, for full-scale boiler furnace design. [24306]

d) Generic Environment

- Completed improvements of graphics model in data handling relative to water pricing and provincial growth rates also expansion of the reservoir data base and enhancement of irrigation module; verified improvements in Water Use Analysis Model (WUAM) including calibration and testing scenarios. [25102]

e) Renewables

- Completed computer model, including manual and documentation for parameters such as available streamflow for electricity generation and its time distribution and flood magnitudes; results will be used to evaluate hydro development projects. [41101]

- Initiated WTC study on anaerobic treatment of chemi-thermo mechanical pulping (CTMP) and kraft bleach plant wastewaters; developed process models and on-line estimators for prediction of process stability; completed Joint WTC/Manitoba/Portage La Prairie anaerobic pilot study, BVF technology selected for full scale installation; full scale anaerobic treatment plant to be installed at pulp mills in Quesnel B.C. and St. George N.B. [45403]

f) New Liquid Fuels

- Completed modifications to oil from sewage sludge pilot plant, and preliminary oil combustion studies; oil upgrading options evaluated and preferred option selected; completed and evaluated acid washing pilot plant for upgrading oil; expanded data base using 1kg/h production unit. [51202]

- The leachate procedure developed by this R&D for liquefied petroleum gas (LPG)/natural gas processing industry waste is being considered for use under the federal Transportation of Dangerous Goods Regulation. Permanent Environment Canada representation on CPA/ERAC research committee was achieved. [57101]

- Completed characterization of condensates and solid residues from co-processing coal/bitumen heavy oil pilot reactors; evaluated condensate pretreatment with crushed coal, and biological treatment of PetroCan/Canmet upgrader condensate. [57114]

- Developed, for impacts of new liquid fuels study, a portable instrument calibration system for vehicle emission characterization; established quality control/quality assurance procedures for emission testing of alcohol-gasoline blends and methanol. [57115]

- Developed test protocol that enables FRP resin samples to be immersed in different types of new liquid fuels, including oxygenated fuels to determine the chemical compatibility. [57116]

g) Oil, Gas, Electricity

- Successfully carried out complementary measurements of mean flow and wave turbulence using three different velocity sensing principles; carried out thorough laboratory calibration procedures for drag spheres and acoustic current meters, to determine the effect of wave orbital velocities on the estimates of mean currents. [62123]

- A successful field experiment was conducted to gather data for the joint distribution of wave heights and periods study in shoaling water; results will be used to predict the forces on offshore engineering structures. [62124]

- Completed modifications to Wright and Wright oil film monitor for remote sensing of chronic oil discharges; completed rig test of sensor. [67206]

- Integrated hydrocarbon monitoring system, for the detection of biological materials on the sea surface, was completed to lab test stage; a loan agreement to allow Environment Canada to utilize hardware purchased by CCRS in finalizing development of the monitor was negotiated. [67237]

- A commercial species exposed to water soluble fractions of Scotian Shelf condensates, was tested to determine its level of toxicity and taint; completed chemical characterization of condensate, examination of hydrocarbon recoveries with extraction techniques used and set-up exposure system. [67238]

- Obtained data from 318 flare facilities in Alberta for the characterization of toxic compounds emitted into the atmosphere; identified significant problems in industrial flaring; data to be used by IPAC, CPA, ERCB, and provincial regulatory agencies. [67239]

- Technical review of produced water treatment was undertaken; communication with offshore oil producers in the U.S. Gulf coast, United Kingdom on the topic of hydrocyclone use in monitoring of oil and grease; offshore oil producers in UK and Norway were asked to complete questionnaires; discussion with British Petroleum Research in the UK on the use of coalescers and other oil removal technologies; and visited Dr. Thew at University of Southampton to discuss the use of hydrocyclones for oil removal from produced water. [67245]

- Concluded that the trickling filter test was unsuitable for a 28-day biodegradability of base oils protocol; cultured oil degrading bacteria from the Beaufort Sea and used it in the first series of tests on continuous dilution. [67246]

C) ENVIRONMENT CANADA ENERGY R&D FINANCIAL AND PERSON-YEAR DISBURSEMENTS 1987-88:

Total PERD resources allocated to all participating Departments amounted to $88.8M and 202 PYs during fiscal year 1987-88 of which $6.9M and 15 PYs was allocated to Environment Canada. Figure 2 illustrates the distribution of departmental PERD resources as spent by service ($6.5M and 15 PYs). In perspective, figure 3 emphasises the increase over the years on the Department participation and the partnership with industry. Departmental support resources amounted to $8.8M and 45.2 PYs and additional funds from DSS UP, NSERC and other outside sources totalled $8.6M. Figure 4 illustrates the distribution of Environment Canada total programme by task for fiscal year 1987-88. The Departmental resources are primarily for PY support. Environment Canada's total Energy R&D programme comprised $22.4M and 56.5 PYs.

Complete details on the disbursement of these resources are provided by Task in Table 1 and by Service in Table 2.

ENVIRONMENT CANADA ENERGY RESEARCH AND DEVELOPMENT PROGRAMME
1987-88 AS SPENT RESOURCE DISTRIBUTION

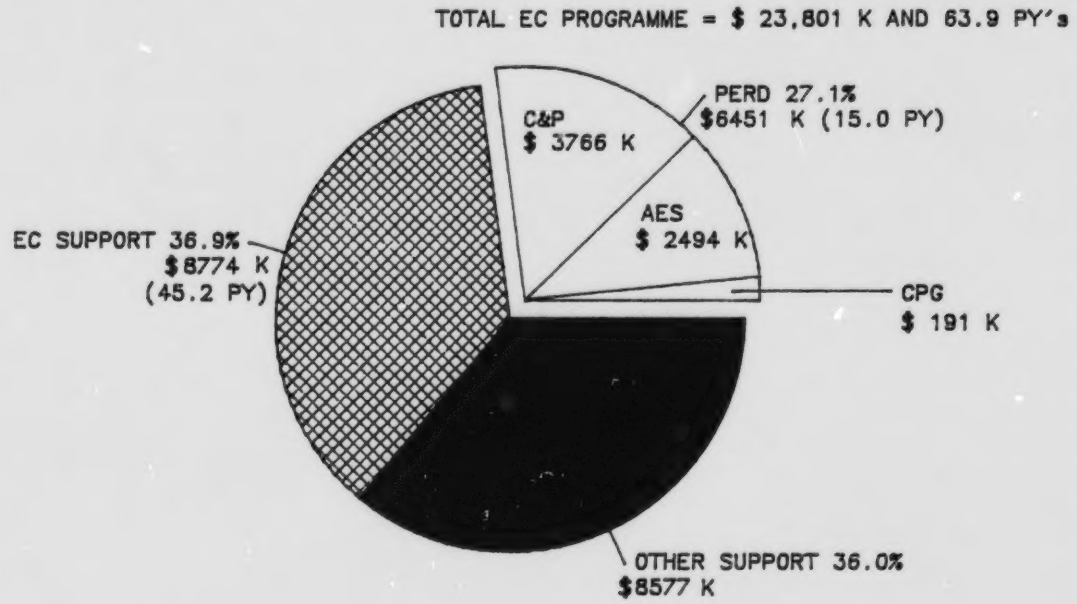


FIGURE 2

1978-88 RESOURCE DISTRIBUTION AS SPENT

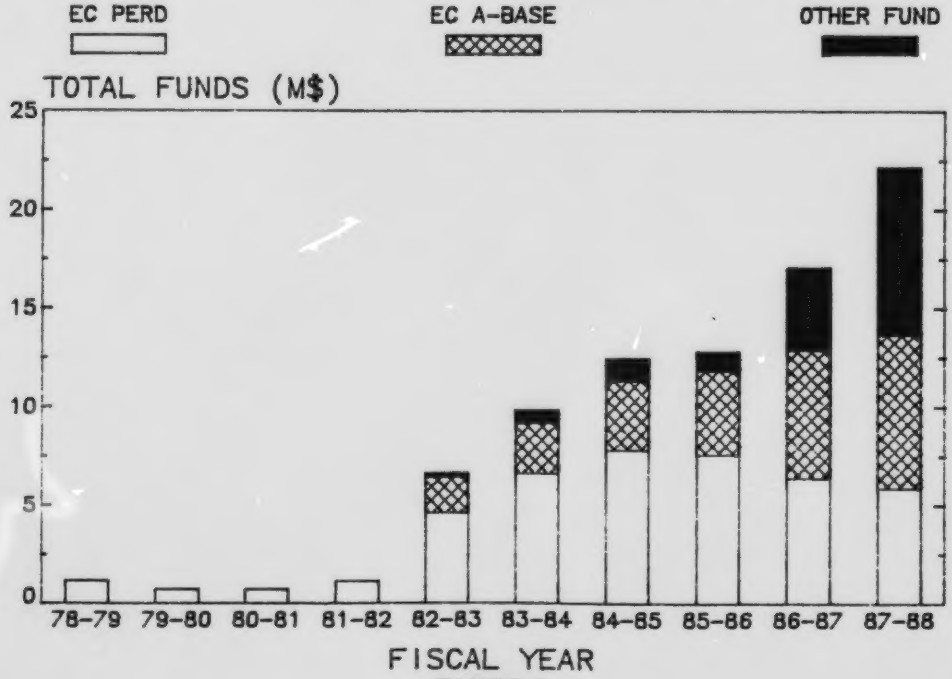


FIGURE 3

ENVIRONMENT CANADA ENERGY RESEARCH AND DEVELOPMENT PROGRAMME
1987-88 AS SPENT RESOURCE DISTRIBUTION BY TASK

TOTAL EC PROGRAMME = $ 23,801 K AND 63.9 PY's

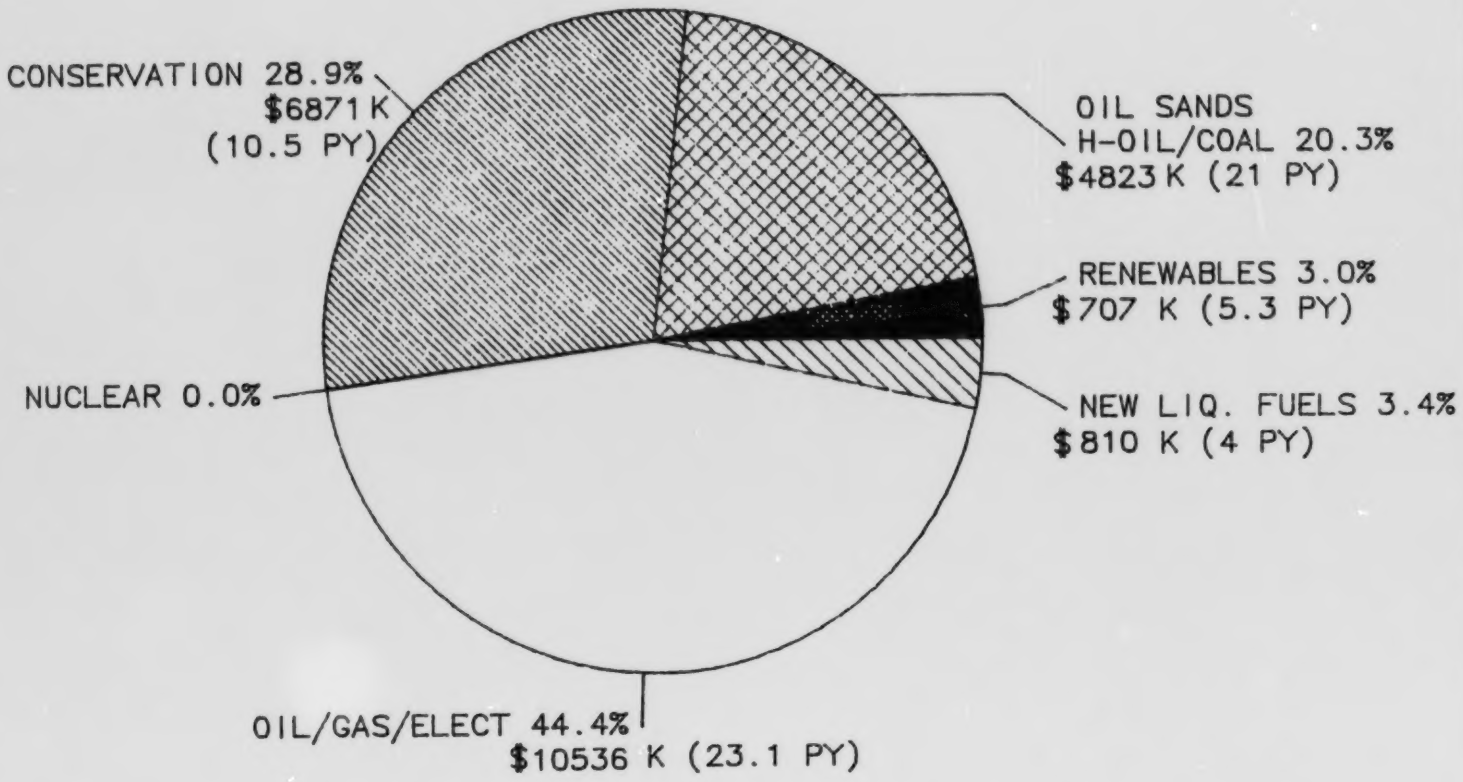


FIGURE 4

Sommaire :

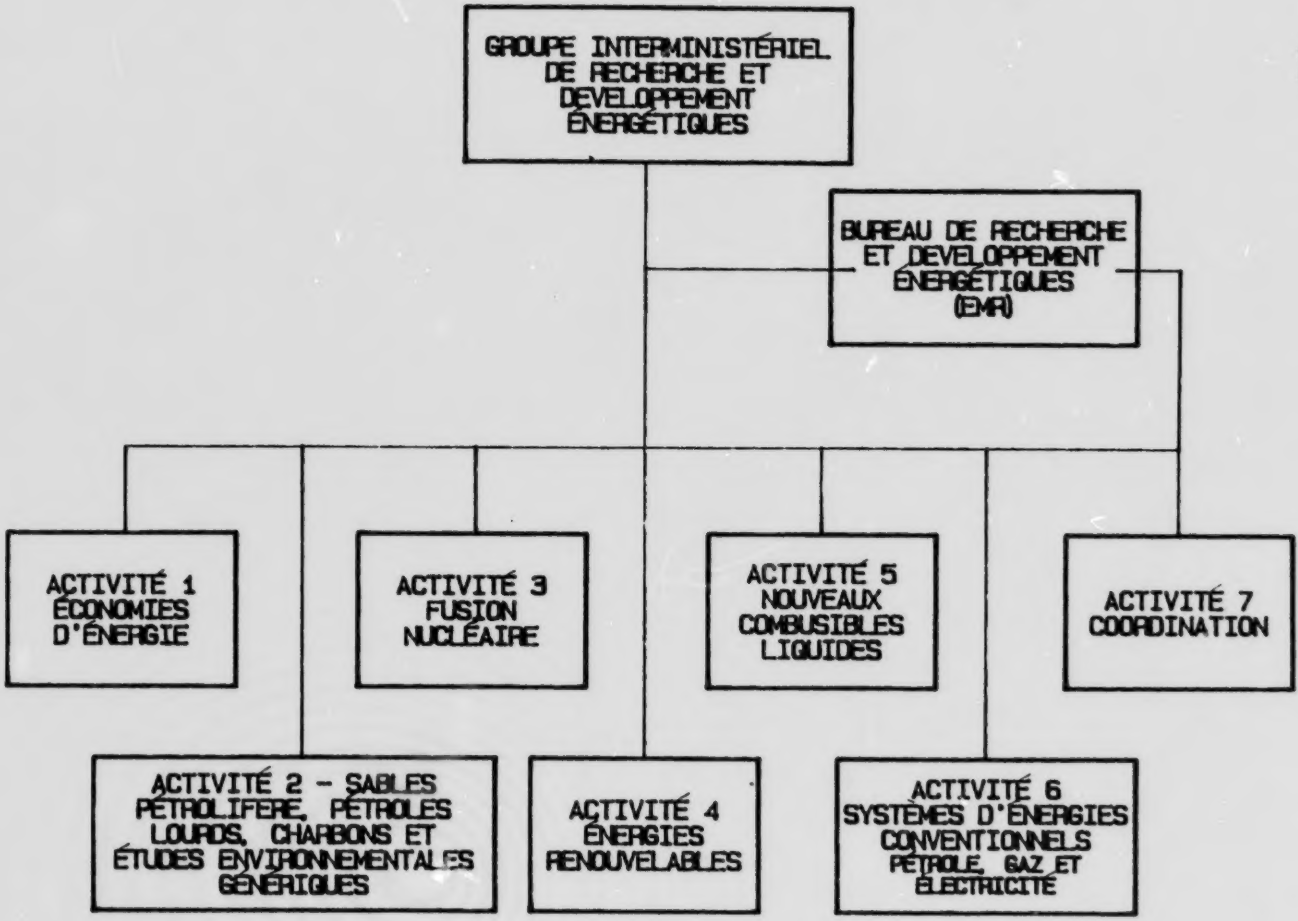
A) INTRODUCTION :

Le présent rapport donne un aperçu détaillé du Programme de recherche et de développement énergétiques d'Environnement Canada associé au Groupe interministériel de recherche et de développement énergétiques (GRDE). Il ne traite que des programmes associés directement aux ressources du Comité et ne porte pas sur les programmes comme les déversements d'hydrocarbures (AMOP) et la fission nucléaire. Les dépenses et les années-personnes pour l'année financière de 1987-1988 étaient respectivement de 23,8 millions de dollars et 63,9 a.-p. Le rapport donne un résumé détaillé des ressources de chaque service, y compris les rapports annuels sur chaque projet. Les ressources mentionnées comprennent celles fournies par le GRDE (6,5 millions de dollars et 15 a.-p.), le soutien fourni par Environnement Canada (EC) (8,8 millions de dollars et 45,2 a.-p.) et 8,6 millions de dollars fournis par les secteurs industriels et provinciaux et d'autres fonds fédéraux (comme le PS du MAS). La part de l'appui fourni par des organismes autres que le Ministère a augmenté considérablement au cours des deux dernières années.

Environ 68 % des ressources du GRDE et d'EC (15,2 millions de dollars) ont été donnés à contrat en 1987-1988. Les ressources du GRDE continuent à constituer une partie importante des ressources totales du Ministère en matière de R&D. Ces ressources jouent donc un rôle important dans nos domaines prioritaires: les pluies acides (c.-à-d. les techniques de contrôle de la combustion du charbon), les produits chimiques toxiques (c.-à-d. le Programme national d'essai et d'évaluation des incinérateurs (NITEP), le projet d'extraction des hydrocarbures des boues d'égout), le changement climatique (c.-à-d. conseiller en CO_2), et la santé et sécurité (Programme canadien d'étude des tempêtes dans l'Atlantique) tout en apportant une contribution importante au développement énergétique sans danger pour l'environnement, partout au Canada. Les domaines prioritaires des ressources fédérales en R&D énergétiques sont : les produits de substitution de l'essence (nouveaux combustibles liquides); un rendement énergétique accru (conservation); les nouvelles sources d'énergie (fusion, énergies renouvelables); et les nouveaux procédés et les nouvelles techniques de production de pétrole (bassin de l'Ouest, terres du Canada).

La figure 1 illustre la structure du GRDE. Les projets du GRDE sont financés par l'entremise de six groupes de travail apparaissant sur la figure 1. Ces groupes de travail sont constitués de comités qui étudient les propositions des ministères participants. Chaque année, les recommandations de ces comités sont soumises à l'approbation du Comité.

STRUCTURE DU PROGRAMME FÉDÉRAL DE R-D ÉNERGÉTIQUES


GROUPE INTERMINISTÉRIEL DE RECHERCHE ET DEVELOPPEMENT ÉNERGÉTIQUES
BUREAU DE RECHERCHE ET DEVELOPPEMENT ÉNERGÉTIQUES (EMR)
ACTIVITÉ 1 ÉCONOMIES D'ÉNERGIE
ACTIVITÉ 2 - SABLES PÉTROLIFERE, PÉTROLES LOURDS, CHARBONS ET ÉTUDES ENVIRONNEMENTALES GÉNÉRIQUES
ACTIVITÉ 3 FUSION NUCLÉAIRE
ACTIVITÉ 4 ÉNERGIES RENOUVELABLES
ACTIVITÉ 5 NOUVEAUX COMBUSIBLES LIQUIDES
ACTIVITÉ 6 SYSTÈMES D'ÉNERGIES CONVENTIONNELS PÉTROLE, GAZ ET ÉLECTRICITÉ
ACTIVITÉ 7 COORDINATION

B) RÉALISATIONS DU PROGRAMME DE R&D ÉNERGÉTIQUES D'ENVIRONNEMENT CANADA EN 1987-88:

La présente section met en lumière quelques-unes des réalisations du programme d'EC au cours de l'année financière de 1987-1988. Les détails sont fournis à la section II dans les rapports de chaque projet (qui comprend également les objectifs, les gestionnaires, les entrepreneurs et les publications de chaque projet). Les chiffres entre parenthèses ( ) sont les numéros de chaque projet du BRDE.

1) SERVICE DE L'ENVIRONNEMENT ATMOSPHÉRIQUE (SEA):

a) Générique - Impacts du gaz carbonique

- On a identifié les principaux incidents de pollution dans l'Est du Canada et préparé une banque de données météorologiques afin d'évaluer la capacité des modèles régionaux de pollution atmosphérique de façon à prévoir les épisodes de dépôts très acides; les résultats des prévisions doivent être utilisés comme système de contrôle complémentaire. (24307)

- On a participé à l'organisation de la Conférence mondiale sur l'atmosphère en évolution, et à l'atelier de l'OCDE sur le changement climatique; préparé et distribué le rapport annuel de 1986 intitulé "Comprendre le CO_2 et le climat" et un numero du bulletin "Le CO_2 et le climat"; présenté des colloques à des étudiants, des chercheurs et des décisionnaires. (25103)

- On a fait des mesures du flux de CO_2 dans la forêt de Borden pour aider à mieux comprendre le cycle du carbone et la question du CO_2/climat; utilisé une méthode simplifiée de transfert de la turbulence pour évaluer les flux de CO_2 durant les journées de vent du sud; mesuré les gradients de température, les concentrations de vapeurs d'eau et de CO_2 à 4 m au-dessus de la forêt; mis les données recueillies en mesures de stockage de la chaleur provenant de biomasse à partir de juin à l'aide d'un thermomètre de mesure du rayonnement par balayage. (25106)

b) Énergies renouvelables

- Des améliorations ont été apportées au modèle de rayonnement solaire du SEA, les changements comprenaient entre autre une meilleure manipulation des données manquantes et un nouveau manuel; les rapports finals de la sous-activité de l'IEA (b)(validation de la modélisation solaire) ont été approuvés; les sous-activitées (d), (e),(f) (mesures du rayonnement pour l'essai d'un collecteur solaire) ont été amorcées. (42102)

- Des améliorations ont été apportées au modèle MF-MICRO pour le flux du vent en terrain complexe; le MF-MICRO et une version pour gros ordinateur du MS3JH/3R ont été distribués; quatre rapports sur l'étude Askervein Hill ont été rédigés pour publication dans le journal; on a continué d'appuyer les normes du SCEE de l'ACNOR (F428- Directives en matière d'évaluation du site) et l'ANNEXE VIII de l'AIE (manuel des applications décentralisées du SCEE). (46101)

c) Pétrole, gaz, électricité

- Les travaux de sélection des tempêtes et de vérification de modèles pour les prévisions à posteriori des vents et des vagues extrêmes sur le Grand banc, la plate-forme Scotian et le banc Georges ont été terminés; une banque de données a été produite pour la prévision à posteriori des vents de tempête dans la mer Beaufort et ces données ont été utilisées dans la réaction/évaluation de l'APGTC du projet Amauligak; on a appliqué le modèle spectral de prévision à posteriori des vents et les vagues sur micro-ordinateur pour obtenir une capacité interne de prévision à posteriori des tempêtes; on a mis au point un système d'analyse pour l'évaluation des statistiques sur les vents dans les stations de collecte des données disséminées dans l'Arctique; on a produit une nouvelle technique d'analyse statistique pour calculer les rafales de vent sur l'océan et en climatologie. (62120)

- On a terminé l'étude de l'application des banques de données actuelles sur l'environnement aux extrêmes environnementaux combinés pour calculer les efforts exercés sur les structures en mer; on a appliqué un logiciel statistique pour le calcul des valeurs extrêmes dans les systèmes d'analyse climatique MAST du SEA. (62121)

- On a terminé un contrat sur les effets environnementaux combinés pour appuyer les besoins techniques en haute mer dans l'Arctique - (1re étape visant à inclure les archives du SEA dans le nouveau code de l'ACNOR); on a terminé l'Atlas marin canadien de la mer de Beaufort, on a utilisé la réaction et l'évaluation de l'APGTC dans le projet d'installation de production à Amauligak de Gulf Canada; on a incorporé la Baie d'Hudson et les banques de données sur les glaces par satellite à l'aide des hyperfréquences (SMMR) dans le CRISP (système d'analyse des glaces de mer)-(1re étape de l'évaluation des données climatiques en modélisation probabilistique des interactions glace-structure. (62322)

- On a mis au point un ensemble complet de données sur l'englacement des navires à partir d'une étude de la recherche de la marine soviétique sur les glaces de 1960 à 1980; on a entrepris la mise au point d'un modèle amélioré sur les glaces pour les bateaux de service; on a terminé un projet d'évaluation conjoint de modèles d'englacement des plate-formes avec le NHL de la Norvège; on a mené un programme de surveillance de l'englacement des installations de forage sur le système SEDCO 710 et les navires de soutiens; on a présenté une recherche financée par le GRDE lors de conférences et d'ateliers internationaux. (62323)

- On a élaboré des équations de prévisions des vents en mer pour les régions marines du Canada; on a testé de façon approfondie des équations sur les ensembles de données indépendantes, y compris le CASP (Programme canadien d'étude des tempêtes dans l'Atlantique). Les résultats indiquent qu'il s'agit d'une bonne méthode pour produire des prévisions fiables des vents dans les régions marines à l'échelle synoptique. (67101)

- On a comparé les modèles de vague spectraux et paramétriques; les résultats ont indiqué que le modèle de vague spectral donne de meilleurs résultats que les produits opérationnels canadiens; et le groupe de travail d'Environnement Canada, de Défense Canada et de Pêches et Océans a recommandé que le modèle ODGP remplace le modèle opérationnel du SEA. Le modèle des marées de tempête du SEA a été testé sur les banques de données du CASP sur la plate-forme Scotian, dans la baie de Fundy et dans le golfe du Maine, et les résultats ont indiqué que ce modèle donnait de bons résultats, bien qu'il n'y ait eu aucun événement pluvio-hydrologique extrême au cours de cette période. (67104)

- La mise au point de logiciel pour traiter un volume limité de données radar par satellite a progressé au point que les sous-systèmes de prétraitement (accentuation) et de géocorrection de l'image ont été mis en oeuvre. Les appareils nécessaires au Système d'intégration des données et d'analyse sur les glaces (SAIRG) ont été achetés et installés; quelques petites études ont été terminées afin de résoudre certains problèmes de conception particuliers au système IDIAS. (67116)

- Un système de communication, ou unité de bande de base, qui permettra de transmettre les informations de qualité et de définition élevées sur les glaces de façon fiable entre l'aéronef de reconnaissance des glaces et le Centre de prévention des glaces est terminé à 95 %; on a fini d'installer le démultiplicateur ICEC. (67118)

- La mise au point d'un logiciel pour le traitement des données profilométriques au laser pour le calcul automatique des statistiques sur le crêtage des glaces est terminée. (67122)

- On a mis au point un modèle de déversement des hydrocarbures en mer capable de prévoir les déplacements et l'étalement des hydrocarbures en présence d'une couverture de glace de concentration moyenne à élevée, on a trouvé une nouvelle formule empirique pour l'étalement de l'huile sur la glace; on a modifié le modèle perfectionné de déversement des hydrocarbures du SEA pour en faire un système compatible avec les ordinateurs personnels IBM. (67126)

- On a poursuivi l'analyse des données recueillies au cours de l'expérience sur le terrain du CASP dans le cadre d'un atelier conjoint CASP/GALE tenu en Virginie. A partir de comparaisons entre des tempêtes dont l'intensité augmente rapidement et des tempêtes dont l'intensité n'augmente pas, on a établi qu'il y avait peu de régions où les tempêtes étaient caractérisées par une convection rapide; un modèle conceptuel des tempêtes du CASP a été présenté aux prévisionnistes afin d'obtenir des prévisions améliorées en milieu opérationnel; on a répondu à de nombreuses demandes de données du CASP provenant de cinq universités canadiennes et six instituts de recherche et universités des États-Unis. (67135)

- On a apporté des changements au logiciel du modèle régional des glaces pour la prévision opérationnelle de la formation, du déplacement et de la détérioration des glaces; on a terminé une évaluation du modèle. (67142)

- On a récupéré le WOTAN dans la mer du Labrador où il a été utilisé pour calculer la moyenne globale et l'étalonnage par rapport à la vitesse du vent au cours des tempêtes; on a rédigé des rapports sur la performance des instruments du WOTAN et sur l'utilisation de la diffusométrie par satellite pour mesurer les vents en mer; on a apporté des changements techniques au prototype de bouée pour les expériences de mélange des hydrocarbures. (67143)

- On a organisé un atelier sur la phase menée sur le terrain du programme ERICA (expérience sur les cyclones d'intensification rapide dans l'Atlantique). (67156)

- La banque de données chimiques pour COBRA, modèle unique élaboré au Canada pour l'évaluation du risque en ce qui a trait aux déversements de liquide et de gaz toxiques a été élargie pour inclure neuf produits chimiques différents. (67219)

- On a fourni une aide aux comités ACE et IEEE pour l'étude des charges que représentent les vents glacés sur les lignes et les pylones de transport; on a accordé un contrat pour la mise au point d'un modèle prototype sur les efforts exercés par la glace et le vent. (68203)

ii) GROUPE DE PLANIFICATION MINISTÉRIEL :

a) Recherches fondamentales sur l'environnement

- Le rapport annuel d'Environnement Canada de 1985-1986 sur la recherche et le développement énergétiques ainsi qu'une série de bulletins sur l'énergie consacrés à d'importants sujets relativement à l'énergie et à l'environnement ont été publiés; on a collaboré avec succès à l'atelier sur la surveillance des effets environnementaux en haute mer et à un important atelier international sur l'incinération des déchets et l'élimination des cendres; on a fourni des services de laboratoire de la Conservation et la Protection, région de l'Atlantique, pour l'application des nouvelles techniques de surveillance en haute mer. (25108)

b) Impact du gaz carbonique

- On a terminé l'organisation de l'atelier sur l'énergie pour la Conférence mondiale sur l'atmosphère en évolution. (25108)

c) Pétrole, gaz et électricité

- On a terminé la planification de l'atelier du Comité PERD 6.7 avec l'Association pétrolière du Canada. (25108)

iii) CONSERVATION ET PROTECTION (CetP):

a) Conservation/Recyclage

- On a conclu huit projets avec l'industrie au cours de 1987-1988; le travail apporté sur la mise au point de matériel, de techniques et de systèmes pour maximiser les possibilités d'économiser l'énergie grâce à la réduction et au recyclage des déchets; six rapports techniques sur la récupération économique des déchets sont actuellement à l'étude en vue de leur publication. (12201)

- Bon fonctionnement de la Bourse canadienne des déchets pour assurer un recyclage accru; la version préliminaire du code de pratique pour la gestion des huiles usées a été complétée; quatre numéros du "Résilog" encourageant la réduction/recyclage ont été publié. (122A1)

- A la suite du réaménagement de l'usine d'épuration des eaux usées de la municipalité de Tillsonburg, selon les configuration de l'opération ainsi que le niveau du débit d'oxygène dissout, on économisa de l'énergie au niveau de l'aération dans l'ordre de 10 à 35%. Une échange des résultats a eu lieu avec les scientifiques de la Suède. (12202)

- Une vérification du système de combustion à deux étapes fut complétée avec succès; le Bulletin d'information du PEENI fut distribué à environ 500 organisations et individus. Deux films documentaires semi-technique couvrant la technologie du système de combustion à deux étapes et de la reduction des émissions toxiques. (12203)

- Une analyse économique des applications de pompes à chaleur dans les secteurs kraft et bris de bois de l'usine de pâtes et papier fut réalisée à certaines usines afin de déterminer l'applicabilité à l'industrie du programme d'ordinateur simulateur du processus (PAPMOD). (12305)

b) Sables bitumineux/huiles lourdes

- Les résultats des études sur l'élimination en puits profonds dans le domaine des sables bitumineux et des huiles lourdes ont été présentés et discutés au cours de colloques techniques donnés conjointement par l'industrie et le gouvernement; on a ouvert un contrat afin de valider les données existantes sur la surveillance des puits profonds et évaluer la capacité du modèle ARC pour prévoir les effets des puits actifs d'injection d'eaux usées des sables bitumineux et des huiles lourdes; un modèle mathématique détaillé a été élaboré pour décrire tous les procédés pertinents associés aux opérations du Laboratoire de recherches souterrain (LRS). (24102)

- Des expériences ont été faites avec un débit diminué et une dose de coagulant pour étudier les effets du temps de rétention et du dosage sur la performance des filtres pour recycler les eaux des bassins de décantation et de stockage des stériles et des boues; on a élaboré un nouveau concept pour les expériences sur l'agitation et la filtration ascendante; on a fait une analyse de faisabilité économique sur la filtration par rapport aux autres options; on a mis au point un procédé capable d'éliminer les déchets différents dans une unité en laboratoire pour connaître la quantité d'huile récupérable; on a traité 400 tonnes de boues résiduaires dans une usine pilote d'une capacité de 5 tonnes/heure afin de fournir des données mises à l'échelle pour des déchets choisis. (24104)

- La première ébauche d'un rapport sommaire sur les caractéristiques des eaux produites dans 20 sites d'huile lourde a été rédigée; on a rédigé un rapport préliminaire sur l'évaluation expérimentale d'un milieu filtrant granulaire; on a terminé des essais en laboratoire, sur le terrain, faits conjointement par l'industrie et le gouvernement sur la filtration et l'évaporation de la compression de vapeurs (VCE); on a entrepris des travaux à l'échelle pilote sur la microfiltration à contre courant pour l'élimination des huiles et des matières solides en suspension dans les eaux produites. (24105)

- Les résultats des recherches visant à établir la possibilité d'un traitement à terre des boues d'huiles lourdes et des résidus de forage provenant des huiles diesel comme pratique de gestion acceptable pour l'environnement, ont eu une grande influence sur les nouvelles directives proposées par l'Alberta. (24106)

c) Charbon

- L'efficacité de la lenticule mineure et des plantes aquatiques émergeantes à ce qui a trait à l'éliminiation des composés d'azote des eaux usées des mines de charbon a été établie; l'état actuel (MTP) de l'équipement et des pratiques de protection de l'environnement utilisés dans les mines de charbon canadiennes et permettant aux exploitants de ces mines de respecter les normes actuelles pour l'air, l'eau et la remise en état des lieux a été définie. (24201)

- On a terminé le travail préliminaire sur les caractéristiques des déchets des injections de sorbant dans les chaudière (FSI) et les procédés d'élimination de ces déchets dans l'usine pilote de l'Ontario Hydro; les résultats auront des répercussions sur les exigences en matière d'élimination des déchets des systèmes FSI de la Saskatchewan Power (SHAND), de l'Ontario Hydro (nanticoke) et de New Brunswick Power (Dalhousie). (24303)

- Des procédés d'élimination améliorés ont été démontrés à l'unité de combustion sur lit fluidisé de Chatham dans le site d'élimination des déchets solides produits au cours de la combustion du charbon; le rapport intitulé "Wastewater Characteristics" a été publié; le rapport indique qu'il existe des possibilités de traitement relativement simple pour éliminer la toxicité des eaux usées des unités de combustion sur lit fluidisé; on a terminé la construction de l'installation de l'Institut national de recherche hydrologique (INRH) pour les essais intérieurs des aquifères (FIAT). (24304)

- Le travail de vérification et d'optimisation des paramètres régissant la neutralisation du SO_2 dans des expériences faites sur une chaudière à l'échelle pilote par utilisation de boues à base de calcium est terminé; les résultats ont indiqué que la récupération du polluant était directement fonction du rapport Ca/S et, dans une moindre mesure, de la température au point d'injection, du degré d'atomisation et de la vitesse axiale relative des gouttelettes de boue; on a mis au point un modèle de prévision des rapports mathématiques entre le débit d'air, l'apport de chaleur, la température des gaz et le transfert de chaleur pour la conception d'une chaudière grandeur réelle. (24306)

d) Recherches fondamentales sur l'environnement

- On a complété l'amélioration du modèle graphique capable de traiter des chiffres relatifs à valeur de l'eau et le taux de croissances des besoins de la province; ainsi que le volume de base de données relatif aux réservoirs et de leur modèle d'irrigation. Le modèle d'analyse de l'utilisation d'eau (WUAM) fut vérifié suite a une amélioration de la calibration et de la mise en épreuve. (25102)

e) Énergies renouvelables

- On a terminé le modèle informatisé, y compris le manuel et la documentation sur les paramètres comme le débit des cours d'eau pour la production d'électricité, sa distribution dans le temps et l'importance des crues; les résultats seront utilisés pour évaluer les projets hydroélectriques. (41101)

- On a commencé l'étude du CTEU sur le traitement anaérobie de la PCTM et des eaux usées des usines de blanchissement de la pâte kraft; on a mis au point des modèles de procédé et des estimateurs en ligne pour la prévision de la stabilité du procédé; on a terminé une étude anaérobie pilote conjointe CTEU/Manitoba/Portage la Prairie; une technique BVF a été choisie pour une installation grandeur réelle qui doit être installée aux usines de pâtes de Quesnel (C.-B.) et St-George (N.-B.). (45403)

f) Nouveaux combustibles liquides

- On a complété les modifications de l'usine pilote d'extraction des hydrocarbures à partir des boues d'égout, ainsi que les études préliminaires sur la combustion des hydrocarbures ont été évaluées et la solution préférée a été choisie; on a complété et évalué l'usine pilote de lavage à l'acide pour le traitement des hydrocarbures; on a élargi la banque de données à l'aide d'une unité de production de 1 kg/h. (51202)

- Le procédé de lixiviation mis au point grâce à ce programme de R&D pour le traitement des déchets industriels à l'aide de gaz de pétrole liquéfié (GPL) gaz naturel est à l'étude pour son utilisation en vertu du règlement fédéral sur le transport des marchandises dangereuses. On a assuré une représentation permanente d'Environnement Canada auprès du Comité de recherche APC/ERAÇ. (57101)

- On a terminé la description des condensats et des résidus solides dans les réacteurs pilotes de traitement des huiles lourdes au charbon/bitume; on a évalué le prétraitement des condensats avec du charbon broyés de PetroCan/Canmet. (57114)

- On a mis au point un système portatif d'étalonnage des instruments pour décrire les émissions des véhicules dans le cadre de l'étude sur les nouveaux combustibles liquides; on a établi des procédés de contrôle et garantie de la qualité pour les essais des émissions des mélanges d'essence/alcool et de méthanol. (57115)

- On a élaboré un protocole d'essai qui permet d'immerger les échantillons de résine FRP dans différents types de nouveaux combustibles liquides, y compris les combustibles oxygénés pour en connaître la compatibilité chimique. (57116)

g) Pétrole, gaz, électricité

- On a mené à bonne fin un programme de mesures complémentaires du débit moyen et de la turbulence des vagues à l'aide de trois principes différents de détection de la vitesse; on a fait un étalonnement approfondi en laboratoire des sphères de résistance et des courantomètres acoustiques pour établir l'effet de la vitesse du mouvement orbital des vagues sur les estimations des courants moyens. (62123)

- On a mené à bien une expérience sur le terrain en vue de rassembler des données pour la distribution conjointe de l'étude de la hauteur et de la période des vagues en eau peu profonde; les résultats seront utilisés pour prévoir les forces exercées sur les stuctures en haute mer. (62124)

- On a complété les modifications au moniteur Wright and Wright de pellicules d'huile pour la télédétection des déversements chroniques d'hydrocarbures; on a complété l'essai sur banc du détecteur. (67206)

- Le système intégré de surveillance des hydrocarbones pour la détection des matières biologiques à la surface de la mer a été complété jusqu'à l'étape des essais en laboratoire; on a négocié un accord de prêt permettant à Environnement Canada d'utiliser les systèmes achetés par le CCT pour parachever la mise au point du détecteur. (67237)

- Une espèce commerciale exposée aux fractions solubles dans l'eau des condensats de la plate-forme Scotian a été testée pour connaître son niveau de toxicité et sa teinte; on a terminé les études de caractérisation chimique du condensat, l'examen de la récupération des hydrocarbures avec des techniques d'extraction et l'installation d'un système d'exposition. (67238)

- On a obtenu les données de 318 installations de brûlage à la torche en Alberta pour la caractérisation des composés toxiques émis dans l'atmosphère; on a cerné les problèmes importants au niveau du brûlage industriel à la torche; les données doivent être utilisées par l'IPAC, l'APC, l'ERCB et les organismes de réglementation des provinces. (67239)

- On a fait une révision technique au sujet des traitements des eaux produites de producteurs de pétrole extra-côtière. On a communiqué avec Ies producteurs pétrole extra-côtière des côtes du Gulf des États-Unis ainsi que le Royaume-Uni, pour discuter de l'utilisation de hydrocyclones afin de mesuré la présence des huiles et du pétrole. Les producteurs de pétrole extra-côtière du Royaume-Uni et de la Norvège complétèrent un questionnaire au sujet du mode de traitement utilisé pour identifier les huiles et le pétrole. On a discuté avec les scientifiques pétroliers britanniques du Royaume-Uni sur la question de l'utilisation des coalescers et d'autres technologies de nettoyage de pétrole et avec M. Thew de l'University of Southampton sur la question de l'utilisation des hydrocyclones pour nettoyage des eaux produites. (67245)

- On a conclu que l'essai sur lit bactérien était inadéquat pour une biodégradation de 28 jours exigée pour les huiles de base; on a cultivé des bactéries de dégradation des hydrocarbures provenant de la mer de Beaufort et on les a utilisées dans une première série d'essais sur la dilution continue. (67246)

C) ENVIRONNEMENT CANADA - R&D éNERGéTIQUES DéPENSES FIANCIèRES ET ANNéES-PERSONNES : 1987-1988

Les ressources totales du GERD allouées à tous les ministères participants s'élèvent à 88,8 millions de dollars et 202 années-personnes dont Environnement Canada reçevait 6,9 millions de dollars et 15 années-personnes en 1987-1988. La figure 2 illustre la répartition des ressources du GERD dépensées par Environnement Canada, par service, pour l'année financière 1987-1988 (6,5 millions de dollars et 15 a.-p.). En perspective, la figure 3 démontre un accroissement de la participation du Ministère et du partenariat avec l'industrie. Les ressources de soutien du Ministère s'élevaient à 8,8 millions de dollars et 45,2 a.-p. et les fonds additionnels provenant du PS du MAS et autre sources externes totalisaient 8,6 millions de dollars. La figure 4 illustre la répartition des ressources du GERD d'Environnement Canada, par activité, pour l'année financière 1987-1988. Les ressources ministérielles sont principalement attribuées aux années-personnes du soutien. Le programme total de R&D énergétiques d'Environnement Canada totalisait 23,8 million de dollars et 63,9 a.-p.

Les détails complets des dépenses concernant ces ressources sont donnés, par tâche, au tableau 1 et par service, au tableau 2.

PROGRAMME DE RECHERCHE ET DÉVELOPPEMENT ÉNERGÉTIQUES D'EC
DISTRIBUTION DES RESSOURCES DÉPENSÉES EN 1987-88

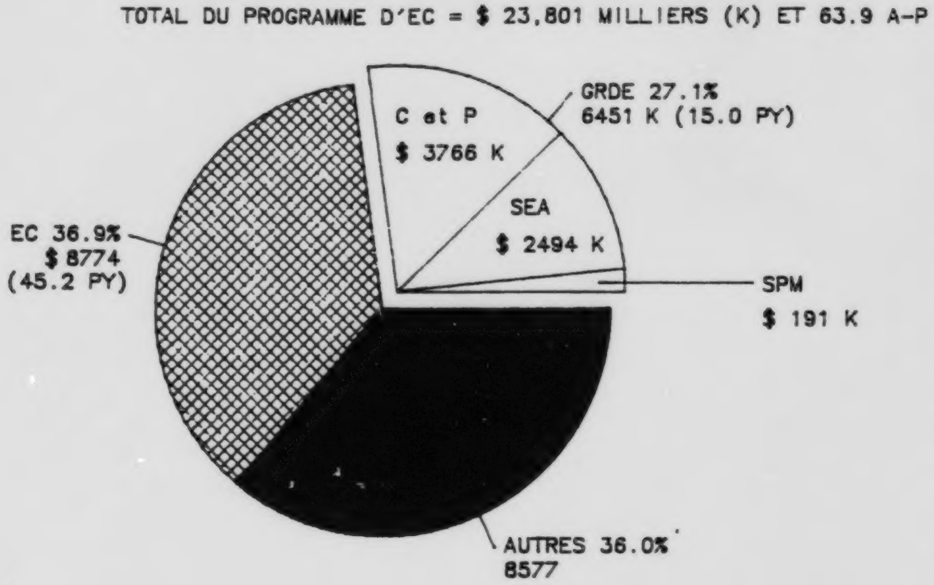


FIGURE 2

DISTRIBUTION DES RESSOURCES DÉPENSÉES 1978-1988

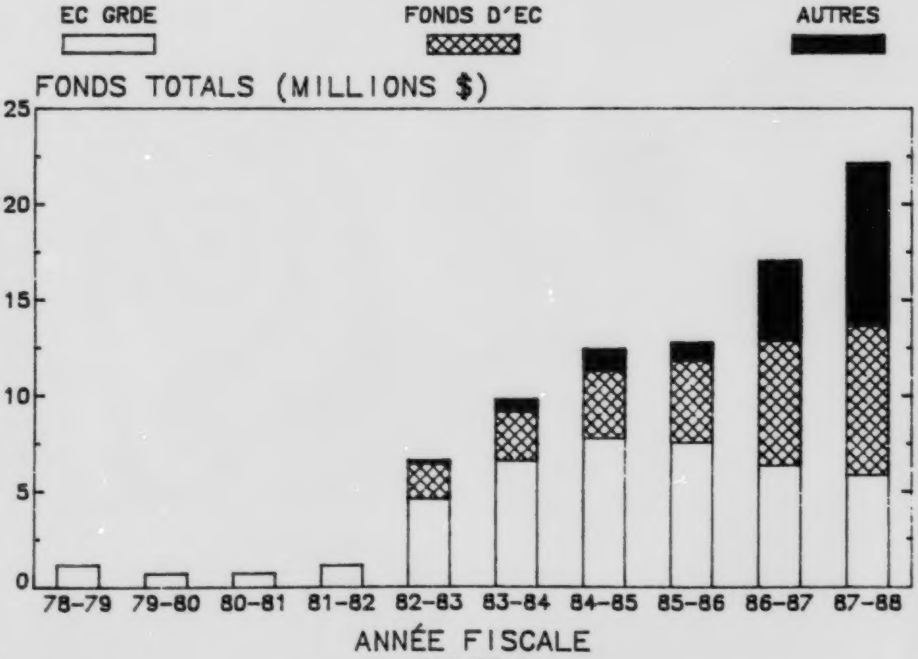


FIGURE 3

PROGRAMME DE RECHERCHE ET DE DÉVELOPPEMENT ÉNERGÉTIQUES D'EC RESSOURCES ALLOUÉES EN 1987-88 PAR ACTIVITÉS

TOTAL DU PROGRAMME D'EC = $ 23 801 K ET 63,9 A-P

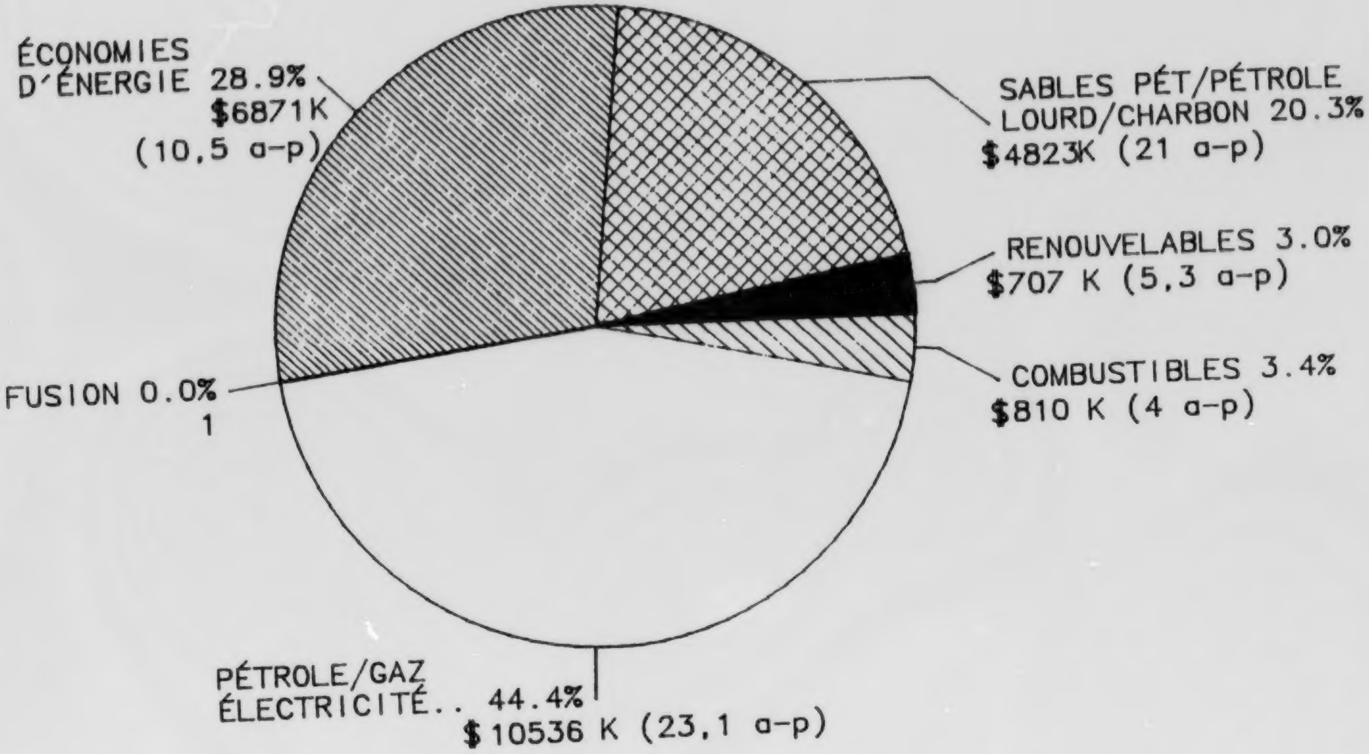


FIGURE 4

TABLE 1

DEPARTMENT: EC

SUMMARY BY TASK AND GRAND TOTAL

PANEL ON ENERGY R&D

TASK	1987-88 PROPOSED PERD		1987-88 AS SPENT K$ AND PY's																												
			INTRAMURAL PERD						EXTRAMURAL PERD					TOTAL PERD	INTRAMURAL EC RESOURCES						EXTRAMURAL EC RESOURCES					TOTAL EC	TOTAL OTHER	TASK TOTAL	
	K$	PY	O&M	Capital	Sal/Ben	S/T PY	Adm PY	Contract	G&C	Sal/Ben	SA PY	Adm PY	DSS FEES PERD	$	O&M	Capital	Sal/Ben	S/T PY	Adm PY	Contract	G&C	Sal/Ben	SA PY	Adm PY	DSS FEES EC	$	RES $	K$	PY
TASK 1 Conservation	1283	2.0	98	42	111	1.0	1.0	838	0	0	0.0	0.0	9	1097	70	0	236	4.0	0.7	985	0	32	3.3	0.5	5	1327	4447	6871	10.5
TASK 2 OilSands/Heavy Oil/Coal/Generic	1663	6.0	350	110	174	3.5	0.0	1015	28	127	2.5	0.0	42	1838	67	62	333	7.7	0.9	77	0	108	2.5	0.4	1	648	2337	4823	21.0
TASK 4 Renewables	334	0.0	30	24	0	0.0	0.0	256	0	0	0.0	0.0	7	316	12	15	274	4.0	0.7	10	0	25	0.6	0.0	0	337	54	707	5.3
TASK 5 New Liquid Fuels	633	2.0	142	17	44	1.0	0.0	351	6	54	1.0	0.0	2	614	76	2	42	1.2	0.2	12	0	22	0.6	0.0	0	156	40	810	4.0
TASK 6 Oil, Gas, Electricity	2943	5.0	209	954	100	3.1	0.0	1182	0	96	1.7	0.2	41	2586	262	123	831	15.9	0.3	4974	0	84	1.6	0.1	33	6306	1699	10590	23.1
GRAND TOTAL	6856	15.0	829	1147	429	8.6	1.0	3642	34	277	5.2	0.2	101	6451	487	202	1716	32.8	2.8	6058	0	271	8.6	1.0	39	8774	8577	23801	63.9 (3)

Notes:

-----	S/T PY	= Scientific, technical, person year allotment for specific project.
	SA PY	= Scientific authority person year allotment for specific project.
	Adm PY	= Administrative, secretarial person year allotment for specific project.
	Intramural PERD	= Panel resources spent in house.
	Extramural PERD	= Panel resources spent on contracts.
	G&C	= Grants and Contributions.
	EC Resources	= Regular departmental "A-base" resources.
	Other Res	= Non PERD $ resources from sources outside the department.

TABLE 2

DEPARTMENT: EC

SUMMARY BY SERVICE AND COORDINATION

PANEL ON ENERGY R&D

SERVICE AND TASK	1987-88 PROPOSED PERD		1987-88 AS SPENT K$ AND PY's																										
			INTRAMURAL PERD					EXTRAMURAL PERD						TOTAL PERD	INTRAMURAL EC RESOURCES					EXTRAMURAL EC RESOURCES						TOTAL EC	TOTAL OTHER RES	TASK TOTAL	
	K$	PY	O&M	Cap-ital	Sal/Ben	S/T PY	Adm PY	Cont-ract	G&C	Sal/Ben	SA PY	Adm PY	DSS FEES PERD	$	O&M	Cap-ital	Sal/Ben	S/T PY	Adm PY	Cont-ract	G&C	Sal/Ben	SA PY	Adm PY	DSS FEES EC	$	$	K$	PY
AES																													
TASK 2 OilSands/Heavy Oil/Coal/Generic	106	1.0	38	0	54	1.0	0.0	105	0	0	0.0	0.0	0	197	0	0	24	0.7	0.0	0	0	5	0.1	0.0	0	29	0	226	1.8
TASK 4 Renewables	134	0.0	25	24	0	0.0	0.0	64	0	0	0.0	0.0	3	116	0	0	135	1.5	0.2	10	0	4	0.1	0.0	0	150	2	268	1.8
TASK 6 Oil, Gas, Electricity	2535	4.0	74	954	100	2.1	0.0	920	0	96	1.7	0.2	32	2181	248	101	446	8.2	0.3	4974	0	74	1.3	0.1	33	5875	1538	9593	13.9
Subtotal AES	2775	5.0	137	978	154	3.1	0.0	1097	0	96	1.7	0.2	35	2494	248	101	605	10.4	0.5	4984	0	83	1.5	0.1	33	6054	1540	10087	17.5
C&P																													
TASK 1 Conservation	1283	2.0	98	42	111	1.0	1.0	838	0	0	0.0	0.0	9	1097	70	0	236	4.0	0.7	985	0	32	3.3	0.5	5	1327	4447	6871	10.5
TASK 2 OilSands/Heavy Oil/Coal/Generic	1457	4.0	272	110	90	2.0	0.0	819	20	97	2.0	0.0	42	1450	67	62	301	7.0	0.7	77	0	63	1.9	0.3	1	571	2337	4358	17.4
TASK 4 Renewables	200	0.0	5	0	0	0.0	0.0	192	0	0	0.0	0.0	4	200	12	15	139	2.5	0.5	0	0	21	0.5	0.0	0	187	52	439	3.5
TASK 5 New Liquid Fuels	633	2.0	142	17	44	1.0	0.0	351	6	54	1.0	0.0	2	614	76	2	42	1.2	0.2	12	0	22	0.6	0.0	0	156	40	810	4.0
TASK 6 Oil, Gas, Electricity	408	1.0	135	0	0	1.0	0.0	254	0	0	0.0	0.0	9	405	14	22	385	7.7	0.0	0	0	10	0.3	0.0	0	431	161	997	9.2
Subtotal C&P	3981	9.0	652	169	245	5.0	1.0	2454	34	151	3.0	0.0	66	3766	239	101	1103	22.4	2.1	1074	0	148	6.6	0.8	6	2672	7037	13475	44.6
CPG																													
TASK 2 OilSands/Heavy Oil/Coal/Generic	100	1.0	40	0	30	0.5	0.0	91	0	30	0.5	0.0	0	191	0	0	8	0.0	0.2	0	0	40	0.5	0.1	0	48	0	239	1.8
Subtotal CPG	100	1.0	40	0	30	0.5	0.0	91	0	30	0.5	0.0	0	191	0	0	8	0.0	0.2	0	0	40	0.5	0.1	0	48	0	239	1.8
GRAND TOTAL	6856	15.0	829	1147	429	8.6	1.0	3642	34	277	5.2	0.2	101	6451	487	202	1716	32.8	2.8	6058	0	271	8.6	1.0	39	8774	8577	23801	63.9

ATMOSPHERIC ENVIRONMENT SERVICE

SERVICE DE L'ENVIRONNEMENT ATMOSPHÉRIQUE

TABLE 3

DEPARTMENT: EC　　　MYOP PLANNING ELEMENT: AES　　　PANEL ON ENERGY R&D

OERD #	TITLE	1987-88 PROPOSED PERD		1987-88 AS SPENT K$ AND PY's																								
				INTRAMURAL PERD					EXTRAMURAL PERD					DSS FEES PERD	TOTAL PERD $	INTRAMURAL EC RESOURCES					EXTRAMURAL EC RESOURCES					DSS FEES EC	TOTAL EC $	TOTAL OTHER RES $	TASK TOTAL	
		K$	PY	O&M	Cap-ital	Sal/Ben	S/T PY	Adm PY	Cont-ract	G&C	Sal/Ben	SA PY	Adm PY			O&M	Cap-ital	Sal/Ben	S/T PY	Adm PY	Cont-ract	G&C	Sal/Ben	SA PY	Adm PY				K$	PY
124307	Regional Scale Meteorological Control Systems	0	0.0	25	0	0	0	0.0	75	0	0	0	0.0	0	100	0	0	6	0	0.0	0	0	0	0	0.0	0	6	0	106	0.1
125103	Carbon Dioxide Adviser	81	1.0	9	0	54	1	0.0	9	0	0	0	0.0	0	72	0	0	18	1	0.0	0	0	0	0	0.0	0	18	0	90	1.6
125106	CO2 Flux Measurement	25	0.0	4	0	0	0	0.0	21	0	0	0	0.0	0	25	0	0	0	0	0.0	0	0	5	0	0.0	0	5	0	30	0.1
	Subtotal TASK 2	106	1.0	38	0	54	1.0	0.0	105	0	0	0.0	0.0	0	197	0	0	24	0.7	0.0	0	0	5	0.1	0.0	0	29	0	226	1.8
142102	Design Information and Measurement Technology	87	0.0	12	13	0	0	0.0	49	0	0	0	0.0	2	76	0	0	85	1	0.2	0	0	0	0	0.0	0	85	2	163	1.2
146101	Resource Assessment	47	0.0	13	11	0	0	0.0	15	0	0	0	0.0	1	40	0	0	50	1	0.0	10	0	4	0	0.0	0	65	0	105	0.6
	Subtotal TASK 4	134	0.0	25	24	0	0.0	0.0	64	0	0	0.0	0.0	3	116	0	0	135	1.5	0.2	10	0	4	0.1	0.0	0	150	2	268	1.8
162117	Engineering Design Criteria	76	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0
162120	Wave/Wind Hindcasting	201	0.5	23	20	14	0	0.0	156	0	9	0	0.0	9	231	77	0	33	1	0.1	0	0	30	1	0.0	0	140	38	408	1.6
162121	Combined Environmental Extremes	40	0.0	2	0	0	0	0.0	35	0	0	0	0.0	3	40	17	0	0	0	0.0	0	0	6	0	0.0	0	23	0	63	0.1
162322	Sea Ice Distribution	172	1.0	8	15	46	1	0.0	91	0	11	0	0.2	4	175	70	0	10	0	0.1	0	0	0	0	0.0	0	80	0	255	1.2

TABLE 3 CONT'D

DEPARTMENT: EC MYOP PLANNING ELEMENT: AES PANEL ON ENERGY R&D

OERD #	TITLE	1987-88 PROPOSED PERD		1987-88 AS SPENT K$ AND PY's																										
				INTRAMURAL PERD					EXTRAMURAL PERD					DSS	TOTAL PERD	INTRAMURAL EC RESOURCES					EXTRAMURAL EC RESOURCES					DSS	TOTAL EC	TOTAL OTHER	TASK TOTAL	
		K$	PY	O&M	Capital	Sal/Ben	S/T PY	Adm PY	Contract	G&C	Sal/Ben	SA PY	Adm PY	FEES PERD	$	O&M	Capital	Sal/Ben	S/T PY	Adm PY	Contract	G&C	Sal/Ben	SA PY	Adm PY	FEES EC	$	RES $	K$	PY
62323	Marine Icing	40	0.0	4	0	0	0	0.0	34	0	0	0	0.0	3	40	26	0	14	0	0.0	0	0	9	0	0.0	0	49	0	89	0.5
67101	Marine Weather Forecasting East Coast	98	0.0	0	0	0	0	0.0	74	0	0	0	0.0	3	77	0	0	55	1	0.0	0	0	0	0	0.0	0	55	0	132	1.0
67104	Waves and Sea State Prediction	244	1.5	0	0	0	0	0.0	135	0	76	2	0.0	5	215	0	0	25	1	0.0	0	0	0	0	0.0	0	25	0	240	2.0
67116	Satellite Radar Studies	730	0.0	0	730	0	0	0.0	0	0	0	0	0.0	0	730	0	0	75	2	0.0	4124	0	0	0	0.0	0	4199	1500	6429	1.5
67110	Satellite Communications	88	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	6	0	0.0	747	0	0	0	0.0	33	785	0	785	0.1
67122	Integrated Ice Recce Systems	257	0.0	0	79	0	0	0.0	0	0	0	0	0.0	0	79	0	0	5	0	0.0	0	0	0	0	0.0	0	5	0	84	0.1
67126	Prediction of Oil Spill Movement in Ice Laden Waters	59	0.0	0	0	0	0	0.0	56	0	0	0	0.0	3	59	0	0	15	0	0.0	0	0	0	0	0.0	0	15	0	74	0.1
67135	Atlantic Storms	305	1.0	13	0	40	1	0.0	270	0	0	0	0.0	0	323	58	76	150	3	0.1	103	0	20	0	0.1	0	407	0	730	4.4
67142	Ice Dynamics Modelling	110	0.0	0	110	0	0	0.0	0	0	0	0	0.0	0	110	0	0	30	1	0.0	0	0	0	0	0.0	0	30	0	140	0.5
67143	Wind Variability in Storms	20	0.0	9	0	0	0	0.0	11	0	0	0	0.0	0	20	0	25	8	0	0.0	0	0	0	0	0.0	0	33	0	53	0.2
67156	Expt. on Rapidly Intensifying Cyclones-Atlantic (ERICA)	0	0.0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	5	0	0.0	0	0	0	0	0.0	0	5	0	5	0.1

TABLE 3 CONT'D

DEPARTMENT: EC

MYOP PLANNING ELEMENT: AES

PANEL ON ENERGY R&D

OERD #	TITLE	1987-88 PROPOSED PERD		1987-88 AS SPENT K$ AND PY's																											
				INTRAMURAL PERD					EXTRAMURAL PERD					DSS FEES PERD	TOTAL PERD $	INTRAMURAL EC RESOURCES					EXTRAMURAL EC RESOURCES					DSS FEES EC	TOTAL EC $	TOTAL OTHER RES $	TASK TOTAL	
		K$	PY	O&M	Capital	Sal/Ben	S/T PY	Adm PY	Contract	G&C	Sal/Ben	SA PY	Adm PY			O&M	Capital	Sal/Ben	S/T PY	Adm PY	Contract	G&C	Sal/Ben	SA PY	Adm PY				K$	PY
67219	LNG Spill Control	25	0.0	6	0	0	0	0.0	19	0	0	0	0.0	0	25	0	0	0	0	0.0	0	0	5	0	0.0	0	5	0	30	0.1
68203	Ice and Wind on Transmission Lines	70	0.0	9	0	0	0	0.0	47	0	0	0	0.0	2	57	0	0	15	0	0.0	0	0	4	0	0.0	0	19	0	76	0.2
	Subtotal TASK 6	2535	4.0	74	954	100	2.1	0.0	920	0	96	1.7	0.2	32	2101	248	101	446	0.2	0.3	4974	0	74	1.3	0.1	33	5875	1538	9593	13.9

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Regional Scale Meteorological Control Systems
OERD Project Number: 24307

2. Manager: Dr A.D. Christie
Department EC/AES
Address: 4905 Dufferin Street
Downsview, Ontario
Phone Number: (416) 739-4471

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	0.00	0.0
PERD As spent	100.00	0.0
EC As spent	6.00	0.1
Other As spent	0.00	0.0
Total As spent	106.00	0.1

4. Contractor(s): c) MEP Consulting
Toronto, Ontario

5. 87-88 Objectives: To demonstrate the use of regional meteorological air pollution models as a supplementary control system for regional high pollution episodes.

6. Accomplishments/Deliverables:
i) The identification of those pollution events that form a major contribution to the pollutant loadings in eastern Canada was performed by scanning the AES data archives to find the highest 20 daily acid deposition evnets during the 1981-1984 period. A subset of events occuring in 1983-84 provided a further analysis based on the availability of appropriate meteorogical data. Ozone episode events in Ontario within the same 2 year period were reviewed to select those having a duration more than 2 days. A final subset (8 events) was chosen that consisted of, where possible, concurrent high acid deposition and oxident events for which suitable meteorological data existed. ii) The preparation of a quality controlled meteorological data base by running an operational weather prediction model to generate predective and diagnostic fields for the selected events. By year end, the most part of the model runs to generate these fields was completed.

7. Problems Encountered/Resolution?
- Some slippage in the projected milestones may have resulted since Dr. Puckett had to replace Dr. Christie in his absence.

8. Publications/Reports in 87-88 or in Press:

9. Recommendations:
-In order to accommodate possible slippage in the schedule, it is suggested that the life time of the project be extended a further 6 months.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Regional Scale Meteorological Control Systems   OERD Project Number: 24307
2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY):   0.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
25.00	0.00	0.0	0.0	0.0	75.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY):   100.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	6.0	0.1	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) =   6.00 (0.1)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) =   0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Carbon Dioxide Adviser OERD Project Number: 25103

2 Manager: H.G. Hengeveld
Address: 4905 Dufferin Street
Downsview, Ontario
Department EC/AES
Phone Number: (416) 739-4323

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	81.00	1.0
PERD As spent	71.90	1.0
EC As spent	18.00	0.6
Other As spent	0.00	0.0
Total As spent	89.90	1.6

4. Contractor(s): N/A

5. 87-88 Objectives: as for 86/87

6. Accomplishment's/Deliverables:
- Participation in IUGG Symposium, Vancouver
- Participation in OECD workshop on climatic change, Washington
- Review & cataloguing of approx 400 articles & reports
- Preparation & dissemination of 1986 annual report "Understanding CO2 & Climate", and one issue of "CO2/Climate Report" newsletter.
- Presentation of seminars to variety of students, researchers & policy makers
- Participation in organization of World Conference on the Changing Atmosphere (June 1988)
- Frequent media interviews, response to numerous information requests.

7. Problems Encountered/Resolution?
-Lack of adequate O&M necessited hiring of term assistant using departmental resources. Large time commitment to conference resulted in cancellation of Spring newsletter and hence underutilization of printing budget by $7K.

8. Publications/Reports in 87-88 or in Press:
-"Understanding CO2 & Climate", 1986
-"CO2/Climate Report", Winter, 1988
-"Climate Change & Water Resource", Proc. of Symp on Interbasin Transfer of Water, Saskatoon, Nov. 1987
-"Warning the Future", Emergency Preparedness Digest, Vol. 15 (1), Jan. 1988

9. Recommendations:
-Program Continuation, with modest increase in O&M resources.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Carbon Dioxide Adviser OERD Project Number: 25103

2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 81.00 (1.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
9.00	0.00	54.0	1.0	0.0	8.90	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 71.90 (1.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	18.0	0.6	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 18.00 (0.6)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: CO2 Flux Measurement   OERD Project Number: 25106

2. Manager: Dr. Neil Trivett   Department EC/AES
Address: 4905 Dufferin Street   Phone Number: (416) 739-4447
Downsview, Ontario

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	25.00	0.0
PERD As spent	24.90	0.0
EC As spent	5.00	0.1
Other As spent	0.00	0.0
Total As spent	29.90	0.1

4. Contractor(s): a) Dr. R. King, University of Guelph
Guelph, Ontario

5. 87-88 Objectives:
i) To calibrate instrumentation and develop techniques for measurement of CO2 fluxes between atmosphere and biosphere, in support of improved understanding of global carbon cycle and the CO2/climate issue.

6. Accomplishments/Deliverables:
- CO2 flux measurements were made at Borden Forest from April to October, using a Bowen-ratio approach.
- Gradients of temperature, water vapour and CO2 concentrations were measured over a 4 m height difference above the forest.
- Biomass heat storage measurements were made from June onwards using a scanning radiation thermometer.
- Data collected during 1987 and the calculated fluxes of heat, water vapour and CO2 to and from the forest have been tabulated and graphed.
- A simplified turbulent transfer method, based on the Guelph simulated particle trajectory model is being used to generate estimates of CO2 fluxes for days with southerly winds.

7. Problems Encountered/Resolution?
-Mechanical problems with the reversing arm to obtain the gradient measurements were encountered in April. Improvements were made to the arm such that excellent reliability was achieved for the rest of the season.

8. Publications/Reports in 87-88 or in Press:
-Results were presented at the AMS Agricultural and Forest Meteorology meeting at Purdue University in September 87. Results will be prepared for publication on completion of the 1988/89 field work.

9. Recommendations:
-Using the techniques developed previously, collect one more season of CO2 flux data and validate the CO2 fluxes Estimated by the model.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: CO2 Flux Measurement OERD Project Number: 25106

2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 25.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	Paid
3.90	0.00	0.0	0.0	0.0	21.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 24.90 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	Paid
0.00	0.00	0.0	0.0	0.0	0.00	0.00	5.00	0.1	0.0	0.00

Total EC K$ (PY) = 5.00 (0.1)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Design Information and Measurement Technology

OERD Project Number: 42102

2. Manager: M. Berry / Dr. J. Reid

Address: Atmospheric Environment Service
4905 Dufferin Street
Downsview, Ontario, M3H 5T4

Department EC/AES
Phone Number: (416) 739-4361

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	87.00	0.0
PERD As spent	75.60	0.0
EC As spent	85.00	1.2
Other As spent	2.20	0.0
Total As spent	162.80	1.2

4. Contractor(s):
a) Solar Instrumentation Research Milton, Ontario
b) PhD. Associates Downsview, Ontario
c) McMaster University Hamilton, Ontario
d) Wyatt MacDonald Toronto

5. 87-88 Objectives: Continue IEA Task XI (Solar Radiation & Pyranometry Studies). Continue leadership of subtask C until its completion & subtask F (Irradiance Measurement for Solar Collector Testing). - Produce publication ready final draft of Solar Radiation Monograph; produce objectives and preliminary plan for arctic solar radiation monitoring & comprehensive solar resource atlas & easily-accessible data base; improve AES radiation model.

6. Accomplishments/Deliverables:
IEA subtask (b) final reports approved. Subtask (c) in final report preparation; scheduled for October 88. Subtasks (d), (e), (f) initiated. Improvements made to AES solar radiation model including better handling of missing data and new manual.

7. Problems Encountered/Resolution?
-Solar Monograph delayed because contractor has not delivered. IEA Task IX, subtask (b) reports not printed because of late delivery of camera-ready copy by contractors; subtask (c) reports delayed till fall 88 due to participant delays. Sky scanner data base delayed due to instrumentation malfunction.

8. Publications/Reports in 87-88 or in Press:
-Wardle, D.I. and Barton, D.V.: "Zero offsets in pyranometer signals related to long-wave radiation, temperature change and ventilation, and some implications regarding measurement uncertainty." AES Internal Report ARPD129X52 p.36. Feb. 1988.
-Swithishnoff, R. "Developing an Automatic Routine for Measuring the temperature dependence of Pyranometers". p.17 August 1987. Discussion paper presented by D.I. Wardle to International Standards Organization (ISO TC-180-SC1) Berlin, Sept 1987.

9. Recommendations: -Continuation of work as outlined in the five year proposal.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Design Information and Measurement Technology — OERD Project Number: 42102
2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 87.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
11.70	13.10	0.0	0.0	0.0	48.50	0.00	0.00	0.0	0.0	2.30

Total Panel K$ (PY): 75.60 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	85.0	1.0	0.2	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 85.00 (1.2)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
Standards Bureau of Canada	2.20	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 2.20 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Resource Assessment — OERD Project Number: 46101

2. Manager: M. Berry / Dr. J. Young — Department EC/AES
Address: Atmospheric Environment Service — Phone Number: (416) 739-4471
4905 Dufferin Street
Downsview, Ontario, M3H 5T4

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	47.00	0.0
PERD As spent	40.40	0.0
EC As spent	64.80	0.6
Other As spent	0.00	0.0
Total As spent	105.20	0.6

4. Contractor(s): a) J.R. Salmon
Toronto, Ontario
b) A. Lucki
Toronto, Ontario

5. 87-88 Objectives: - Publish a series of specialized wind energy analyses for 144 sites in Canada with national wind energy maps. - Preparation of journal articles on Askervein Hill Study. - Implementation on an improved model (MF-MICRO) for wind flow in complex terrain. - Continuing support to CSA WECS committees and standards and IEA Task VIII.

6. Accomplishments/Deliverables:
- Four journal papers on the Askervein Hill study have been prepared for publication;
- Improvements to the MF-MICRO model for wind flow in complex terrain were made; MF-MICRO and a mainframe computer version of MS3JH/3R were widely distributed;
- Support continued for CSA WECS standards (initial meeting of new F428 - Siting guidelines) and IEA ANNEX VIII (draft 6 of chapter 2 of Handbook for decentralized Wecs Applications completed).

7. Problems Encountered/Resolution?
-Publication of Wind Energy books has been delayed, many of its objectives will be met by new CSA F428 standard. -Micro version of MSFD model (supplementary to MF-MICRO) delayed as problems with terrain contouring routines found and corrected.

8. Publications/Reports in 87-88 or in Press:
-Beljaars, A.C.M., Walmsley, J.L. and Taylor, P.A. 1987:Modelling of Turbulence over Low Hills and Varying Surface Roughness. Boundary Layer Meteorology, 41, 203-215.
-Mickle, R.E., Cook, N.J., Hoff, A.M., Jensen, N.O., Salmon, J.R., Taylor,

P.A., Terzlaff, G. and Teunissen, H.W., 1988:The Askervein Hill Project: Vertical Profiles of Wind and Turbulence. Boundary Layer Meteorology,43 143-169.

-Raithley, G.D., Stubley, G.D. and Taylor, P.A., 1987: The Askervein Hill project: A Finite Control Volume Model Prediction of three-Dimensional Flows over the Hill. Boundary Layer Meteorology, 39, 247-267.

-Salmon, J.R., Bowen, A.J., Hoff, A.M., Johnson, R., Mickle, R.E., Taylor, P.A., Terzlaff, G. & Walmsley, J.L., 1988: Mean Wind Variations at Fixed Height Above Ground. Boundary Layer Meteorology, 43, 247-271.

-Salmon, J.R., Teunissen, H.W., Mickle, R.E., & Taylor, P.A., 1988: Field Observations, Wind Tunnel Simulations, & Numerical Predictions for Flow over a Low Hill. Boundary Layer Meteorology (in press).

-Walmsley, J.L. & Taylor, P.A., 1987: A preliminary demonstration of the use of Boundary Layer Models of Flow in Complex Terrain for High Resolution Surface Wind Forecasting. ESA Journal, SP-282, 539-543.

-Walmsley, J.L. & Taylor, P.A., 1987: A Preliminary Study of the Use of Boundary Layer Models of Flow in Complex Terrain for High Resolution Surface Wind Forecasting. Proc. AES/CMOS Second Workshop on Operational Meteorology, Halifax, 14-16 October, 1987, AES/CMOS, Halifax, 395-404pp.

-Salmon, J.R., Taylor, P.A. & Walmsley, J.L., 1988: Recent Developments Using the MS3DJH & MSFD Models of Boundary-layer Flow Over Complex Terrain. Extended Abstracts. 8th AMS Symposium on Turbulence & Diffusion, San Diego, 1988.

-Taylor, P.A., 1988: Boundary-Layer Flow over Topography - A Brief Review of some Atmospheric Studies. Proc. ACOS Workshop on Roughness and Friction - to appear as NRC publication.

9. Recommendations:

-Extension of this and related work through 1992/93 as per the five year proposal.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Resource Assessment OERD Project Number: 46101

2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 47.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
12.80	11.20	0.0	0.0	0.0	15.40	0.00	0.00	0.0	0.0	1.00

Total Panel K$ (PY): 40.40 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	50.4	0.5	0.0	10.00	0.00	4.00	0.1	0.0	0.40

Total EC K$ (PY) = 64.80 (0.6)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Wave/Wind Hindcasting — OERD Project Number: 62120

2. Manager: A. Saulesleja (V.R. Swail) — Department EC/AES
Address: 4905 Dufferin Street,
Downsview, Ontario,
M3H 5T4
Phone Number: (416) 739-4347

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	201.00	0.5
PERD As spent	230.60	0.5
EC As spent	139.80	1.1
Other As spent	38.00	0.0
Total As spent	408.40	1.6

4. Contractor(s):
- MacLaren Plansearch Ltd., Halifax, N.S.
- T.W. Mathews, Scarborough, Ontario

5. 87-88 Objectives:
- To develop new methodologies for the specification of historical marine wind fields
- To produce extreme wind/wave hindcasts for the Grand Banks and Scotian Shelf areas
- To produce extreme wind/wave hindcasts for the Beaufort Sea.

6. Accomplishments/Deliverables:
- completed storm selection and model verification for extremes wind/wave hindcast on Grand Banks/Scotian Shelf/Georges Banks
- produced a data base of hindcast storm winds for Beaufort Sea, used in COGLA's response/evaluation of Amauligak proposal
- implemented spectral wind/wave hindcast model on micro-computer, to allow in-house storm hindcast capability
- implemented spectral wind/wave forecast model on METOC Centre computer for extension of hindcast from analysis fields
- developed an analysis system for the estimation of wind statistics in data sparse Arctic locations
- produced a new statistical analysis technique for computing wind gusts over oceans and climatology
- journal article on spatial variability of marine wind speed observations
- presented PERD-funded research at international conferences and workshop.

7. Problems Encountered/Resolution?
- None.

8. Publications/Reports in 87-88 or in Press:

- -Brown, R.D., and V.R. Swail, 1988, The spatial coherence of marine wind speed observations. Canadian Meteorological Society. Atmosphere-Ocean (in press)
- -Lewis, P.J., M.D. Moran, V.R. Swail and T.A. Agnew, 1988, Severe storms over Canada's ocean waters: 1957-1983. Canadian Meteorological and Oceanographic Society. Climatological Bulletin 22(1): 3-21.
- -MacLaren Plansearch Ltd., 1987, Wind/wave hindcast extremes Grand Banks/Scotian Shelf - project management documentation. Prepared for Atmospheric Environment Service, Downsview, Ontario, under contract no. KM169-7-6678, 78 p.
- -Swail V.R. and R.D. Brown, 1988, Wind gusts over water. Proceedings 7th American Meteorological Society Conference on Ocean-Atmosphere Interaction February 1-5, 1988, Anaheim, CA, p. 142-145.

9. Recommendations:

-Continuation of extremes wind/wave hindcasts for Grand Banks/Scotian Shelf/Georges Bank and Beaufort Sea.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Wave/Wind Hindcasting OERD Project Number: 62120

2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 201.00 (0.5)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./ Tech.	Admin.				Sci./ Auth.	Admin.	
23.40	20.00	13.8	0.3	0.0	155.50	0.00	9.20	0.2	0.0	8.70

Total Panel K$ (PY): 230.60 (0.5)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./ Tech.	Admin.				Sci./ Auth.	Admin.	
76.60	0.00	33.2	0.5	0.1	0.00	0.00	30.00	0.5	0.0	0.00

Total EC K$ (PY) = 139.80 (1.1)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
DFO/COGLA/NOGAP	38.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 38.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Combined Environmental Extremes

OERD Project Number: 62121

2. Manager: A. Saulesleja (V.R. Swail)

Address: 4905 Dufferin Street,
Downsview, Ontario,
M3H 5T4

Department EC/AES
Phone Number: (416) 739-4347

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	40.00	0.0
PERD As spent	40.00	0.0
EC As spent	23.30	0.1
Other As spent	0.00	0.0
Total As spent	63.30	0.1

4. Contractor(s):
- Det Norske Veritas (Canada) Ltd., Calgary, Alta.
- T.W. Mathews, Scarborough, Ontario.

5. 87-88 Objectives:
- to develop and implement methods to estimate the occurence of combined extreme events.

6. Accomplishments/Deliverables:
- completed study on the applicability of present environmental data bases on combined environmental extremes for calculation of loads on offshore structures
- implemented statistical software for computation of extreme values in AES MAST climate analysis systems

7. Problems Encountered/Resolution?
- None.

8. Publications/Reports in 87-88 or in Press:
- Det Norske Veritas, 1988, The applicability of data bases on combined environmental extremes for calculation of loads on offshore structures. Produced for Atmospheric Environment Service, Downsview, Ontario, under contract no. 02SE-KM169-6774, 84 p.
- Maes, M.A., L.R. Muir and V.R. Swail, 1988, Variability of environmental loads. Ocean Engineering 15(2): 171-187.

9. Recommendations:
- develop algorithms for probability of load combinations due to environmental factors and implement in climate analysis software.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Combined Environmental Extremes OERD Project Number: 62121
2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 40.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
1.90	0.00	0.0	0.0	0.0	35.00	0.00	0.00	0.0	0.0	3.10

Total Panel K$ (PY): 40.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
17.30	0.00	0.0	0.0	0.0	0.00	0.00	6.00	0.1	0.0	0.00

Total EC K$ (PY) = 23.30 (0.1)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Sea Ice Distribution

OERD Project Number: 62322

2. Manager: B. Maxwell
Address: 4905 Dufferin Street,
Downsview, Ontario

Department EC/AES
Phone Number: (416) 739-4374

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	172.00	1.0
PERD As spent	175.00	1.0
EC As spent	80.00	0.2
Other As spent	0.00	0.0
Total As spent	255.00	1.2

4. Contractor(s): a) Laura Spicer; Hamilton, Ontario
b) Ian Jordaan & Assoc.; St. John's, Nfld.
c) Tom Mathews; Scarborough, Ontario
d) PhD Associates; Downsview, Ontario

5. 87-88 Objectives:
To develop a sea ice information system for Canadian waters in support of offshore arctic engineering design needs and support government regulatory agencies.

6. Accomplishments/Deliverables:
- Completion of a combined environmental effects (including ice) contract - 1st step in including AES archive in new CSA code
- Completion of the Canadian Beaufort Sea Marine Atlas - used in COGLA's response and evaluation of Gulf Canada's proposed Amauligak Production facility.
- Completion of a feasibility contract into using the Climate Centre Archive in probabilistic ice-structure interaction modeling.
- Incorporated the Hudson Bay and the satellite microwave (SMMR) ice databases into CRISP - 1st step in evaluating satellite derived climate data.

7. Problems Encountered/Resolution?
- None.

8. Publications/Reports in 87-88 or in Press:
1. Agnew T. and T. Mathews, An Ice and Snow Climate Information System (CRISP) : published in the Proceedings of the Ports and Ocean Engineering under Arctic Conditions Conference, August 17-21, 1987, Fairbanks, Alaska.
2. Agnew, T., Spicer, L. and B. Maxwell (1987), Marine Climatological Atlas - Canadian Beaufort Sea: CCC Report # 87-14.
3. Environment Canada (1988): CRISP User's Manual version 2 Downsview, Ontario: Atmospheric Environment Service, Canadian Climate Centre, 260 pp.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Sea Ice Distribution OERD Project Number: 62322

2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 172.00 (1.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
8.00	15.00	45.6	0.8	0.0	91.40	0.00	11.40	0.0	0.2	3.60

Total Panel K$ (PY): 175.00 (1.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
70.00	0.00	10.0	0.1	0.1	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 80.00 (0.2)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Marine Icing
OERD Project Number: 62323

2. Manager: A. Saulesleja (V.R. Swail)
Address: 4905 Dufferin Street
Downsview, Ontario
M3H 5T4
Department EC/AES
Phone Number: (416) 739-4347

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	40.00	0.0
PERD As spent	40.00	0.0
EC As spent	49.30	0.5
Other As spent	0.00	0.0
Total As spent	89.30	0.5

4. Contractor(s): - Compusult Ltd., St. John's, Nfld.
- University of Alberta, Edmonton, Alta.

5. 87-88 Objectives:
To develop new methodologies for the estimation of icing on drilling platforms and supply vessels operating in offshore locations.

6. Accomplishments/Deliverables:
- developed comprehensive vessel icing data set from review of Soviet marine icing research 1960-80.
- initiated development of improved icing model for the supply vessels.
- completed joint platform icing model evaluation project with NHL of Norway (ahead of schedule).
- carried out rig icing monitoring program on SEDCO 710 and attendant supply vessels.
- presented PERD-funded research at international conferences and workshops.
- produced Vol. 2. No. 1. of international Marine Icing Newsletter.

7. Problems Encountered/Resolution?
- None.

8. Publications/Reports in 87-88 or in Press:
-Brown, R.D. and I. Horjen, 1988: Evaluation of state-of-the-art drilling platform icing models. Downsview, Ontario: Atmospheric Environment Service, Canadian Climate Centre Report (in preparation).
-Brown, R.D., I. Horjen, T. Jorgenson and P. Roebber, 1988: Evaluation of state-of-the-art drilling platform ice accretion models. Paper to be presented at 4th Int'l. Workshop on Atmospheric Icing of Structures, Paris France, September 3-5, 1988.
-Brown, R.D. and P. Mitten, 1988: Ice accretion on drilling platforms off the east coast of Canada. Paper to be presented at POLARTECH'88, Trondheim, Norway, 15-17 June, 1988.

-Mitten P., 1988: Rig icing monitoring program 1987-88. Prepared for Atmospheric Environment Service, Downsview, Ontario, under DSS Contract No.09SE.KM169-7-0049 (in preparation).

-Lozowski, P. and W.P. Zakrzewski, 1988: Soviet Marine Icing Data. Downsview, Ontario: Atmospheric Environment Service, Canadian Climate Centre Report (in preparation).

-Brown, R.D., 1987: Prediction of ice accretion loads on offshore structures. ARCTIC NEWS-RECORD AND POLAR BULLETIN, Spring, 1987, p. 21.

-Mitten, P., 1987: Rig icing monitoring program 1986-87. Prepared for Atmospheric Environment Service, Downsview, Ontario, under DSS Contract No. 01SE.KM169-6-6308, 37pp.

-Roebber, P. and P. Mitten, 1987: Modelling and measurement of icing in Canadian waters. Downsview, Ontario: Atmospheric Environment Service, Canadian Climate Centre Report 87-15, 150 pp.

9. Recommendations:

- Measure spray and ice accretion on rigs and supply vessels.
- Include time-dependent effects into platform icing model.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Marine Icing OERD Project Number: 62323

2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 40.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY) Sci./Tech.	(PY) Admin.	Contract	Contribution	Sal.& Ben.	(PY) Sci./Auth.	(PY) Admin.	Fees Paid
3.60	0.00	0.0	0.0	0.0	33.70	0.00	0.00	0.0	0.0	2.70

Total Panel K$ (PY): 40.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY) Sci./Tech.	(PY) Admin.	Contract	Contribution	Sal.& Ben.	(PY) Sci./Auth.	(PY) Admin.	Fees Paid
26.30	0.00	13.8	0.3	0.0	0.00	0.00	9.20	0.2	0.0	0.00

Total EC K$ (PY) = 49.30 (0.5)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Marine Weather Forecasting East Coast
OERD Project Number: 67101

2. Manager: A. Bealby
Department EC/AES
Address: Downsview, Ontario
Phone Number: (416) 739-4908

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	98.00	0.0
PERD As spent	76.60	0.0
EC As spent	55.00	1.0
Other As spent	0.00	0.0
Total As spent	131.60	1.0

4. Contractor(s): a) Horler Information Inc., Ottawa, Ontario

5. 87-88 Objectives:
- Develop an improved marine wind forecast system for forecast periods out to 5 days.
- Test the system using newest operational NWP model.
- Automate day 3-5 day marine wind forecast.

6. Accomplishments/Deliverables:
-Marine wind forecast equations have been developed for Canadian marine areas. These equations have been thoroughly tested on the independent datasets, including the CASP dataset. These results show this procedure to be a viable way of producing a good wind forecast for marine areas on the synoptic scale.

7. Problems Encountered/Resolution?
-Because of shortage of in-house resources, implementation is not yet complete although it has started. It is expected to be complete by fall 1988.

8. Publications/Reports in 87-88 or in Press:
-Sarrazin, R., 1987:"Verification of Experimental Statistical Forecasts Produced During CASP", Internal MSRB Report, 64 pp.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Marine Weather Forecasting East Coast OERD Project Number: 67101
2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 98.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./ Tech.	Admin.				Sci./ Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	73.70	0.00	0.00	0.0	0.0	2.90

Total Panel K$ (PY): 76.60 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./ Tech.	Admin.				Sci./ Auth.	Admin.	
0.00	0.00	55.0	1.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 55.00 (1.0)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Waves and Sea State Prediction OERD Project Number: 67104

2. Manager: A. Bealby
Address: Downsview, Ontario
Department EC/AES
Phone Number: (416) 739-4908

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	244.00	1.5
PERD As spent	215.30	1.5
EC As spent	25.00	0.5
Other As spent	0.00	0.0
Total As spent	240.30	2.0

4. Contractor(s): a) Offshore & Coastal Techniques Inc., Vicksburg, Miss.
b) Ocean Weather Inc., Cos Cob, Conn.
c) MacLaren Plansearch, Halifax, N.S.
d) Atmospherics Dynamics Corp., Victoria, B.C.

5. 87-88 Objectives:
- Decision on spectral vs. parametric ocean wave model and development of a Canadian model by chosen strategy.
- Test results for storm surge model.

6. Accomplishments/Deliverables:
The results of the model intercomparison showed that the spectral wave models performs better than the Canadian operational products. A DOE, DND and DFO working group has recommended that the ODGP model replace AES's operational model. Along with this, it is planned to produce a good quality T=0 product that will be archived by DFO and AES and replace the hindcasting of wave data for climatological archives.
The AES storm surge model was tested on CASP datasets for the Nova Scotia shelf, Bay of Fundy and Gulf of Maine. The results show skill although there were no extreme events in the period. Runs with subjectively derived wind fields performed better than runs driven by CMC wind fields.

7. Problems Encountered/Resolution?
-A contract was let to purchase the ODGP wave model code for the Atlantic area. The contract is a few months behind schedule with the model now to be delivered by June 1988.

8. Publications/Reports in 87-88 or in Press:
-Contract Report "Further testing of the AES storm surge model (expanded version) for the Nova Scotia shelf", Atmospheric Dynamics Corp. DSS Contract No. KM191-7-6942.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Waves and Sea State Prediction OERD Project Number: 67104

2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 244.00 (1.5)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	134.60	0.00	76.00	1.5	0.0	4.70

Total Panel K$ (PY): 215.30 (1.5)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	25.0	0.5	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 25.00 (0.5)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Satellite Radar Studies OERD Project Number: 67116

2. Manager: John C. Falkingham Department EC/AES
Address: Ice Centre Environment Canada Phone Number: (613) 996-4297

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	730.00	0.0
PERD As spent	730.00	0.0
EC As spent	4198.60	1.5
Other As spent	1500.00	0.0
Total As spent	6428.60	1.5

4. Contractor(s):
a) MacDonald Dettwiler and Associates Ltd.
Richmond, B.C.
b) University of British Columbia
Vancouver, B.C.
c) University of Waterloo
Waterloo, Ontario.

5. 87-88 Objectives:
-Procure necessary equipment to process a limited volume of radar data and commence software development.

6. Accomplishments/Deliverables:
-The hardware for the Ice Data Integration and Analysis System (IDIAS) was purchased and installed at the contractor's factory in Vancouver. Software development has progressed to the point where the image preprocessing (enhancement) and image geocorrection subsystems have been functionally completed and accepted. Work continues on the graphics subsystem and the integration of all of the software components.
-Additionally, a number of small studies carrying over from the previous year were completed to address particular IDIAS design problems. The reports produced are documented below.

7. Problems Encountered/Resolution?
- None.

8. Publications/Reports in 87-88 or in Press:
-Botman, A.M.; A Qualitative Investigation of Variables used in the Creation & Interpretation of Animated AVHRR Sequences; Ice Centre Environment Canada, Internal Report; August 1987.
-Reedman, L.C.; The Validation and Use of ORBCALC for Investigative Purposes; Ice Centre Environment Canada, Internal Report; August 1987.
-Collins, M.; The Estimation of Sea Ice Motion in Digital Satellite Imagery by

Matched Filtering; UBC masters thesis; March 1987.
-Emery, W.J. and M. Collins; New Approaches to the Automated Estimation of Sea Ice Motion from Digital Satellite Imagery; EOS, Vol.67, #44, p.1016.
-Emery, W.J. and M. Collins; A Computational Method for Estimating Sea Ice Motion in Sequential SEASAT/SAR Imagery by Matched Filtering; to be published in Journal of Geophysical Research.
-deAbreu, R.; 4 & 8 Bit SAR Image Reduction : A Qualitative Analysis; Ice Centre Environment Canada Internal Report; May 1987.
-Ramsay, B.R., Henderson, D. and Carson, L.; Real-Time Processing of Digital Image Data in Support of the Canadian Sea Ice Analysis and Prediction Program; in press for presentation at the 1988 International Geoscience and Remote Sensing Symposium.

9. Recommendations:

-Continue to support the project at the funding levels requested.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Satellite Radar Studies OERD Project Number: 67116

2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 730.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY) Sci./Tech.	(PY) Admin.	Contract	Contribution	Sal.& Ben.	(PY) Sci./Auth.	(PY) Admin.	Fees Paid
0.00	730.00	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 730.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY) Sci./Tech.	(PY) Admin.	Contract	Contribution	Sal.& Ben.	(PY) Sci./Auth.	(PY) Admin.	Fees Paid
0.00	0.00	75.0	1.5	0.0	4123.60	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 4198.60 (1.5)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
EM&R - Canadian Ground System	0.00	1500.0	0.0	0.00	0.0

Total Other K$ (PY) = 1500.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Satellite Communications

OERD Project Number: 67118

2. Manager: D.H. Champ
Address: 4905 Dufferin Street
Downsview, Ontario
M3H 5T4

Department EC/AES
Phone Number: (416) 739-4931

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	88.00	0.0
PERD As spent	0.00	0.0
EC As spent	785.20	0.1
Other As spent	0.00	0.0
Total As spent	785.20	0.1

4. Contractor(s): a) Miller Communications Systems
300 Leggett Drive
Kanata, Ontario

5. 87-88 Objectives:
- complete airborne baseband unit and ICEC demultiplexer.
- let contract for Phase 1 of satellite link from aircraft to ICEC.

6. Accomplishments/Deliverables:
- airborne baseband unit 95% complete.
- demultiplexer completed.

7. Problems Encountered/Resolution?
- The contract for a commercial ice reconnaissance service was let to INTERA Technologies in the Spring of 1987. The system design was different from that envisaged by AES, & some considerable time was spent agreeing on the final design.

8. Publications/Reports in 87-88 or in Press:
- None.

9. Recommendations:
- The project is now back on track technically. Funding should be continued as stated in the revised proposal for this project.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Satellite Communications OERD Project Number: 67118

2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 88.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 0.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	5.5	0.1	0.0	747.00	0.00	0.00	0.0	0.0	32.70

Total EC K$ (PY) = 785.20 (0.1)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Integrated Ice Recce Systems OERD Project Number: 67122

2. Manager: D.H. Champ
Address: 4905 Dufferin Street
Downsview, Ontario
M3H 5T4

Department EC/AES
Phone Number: (416) 739-4931

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	257.00	0.0
PERD As spent	78.80	0.0
EC As spent	5.00	0.1
Other As spent	0.00	0.0
Total As spent	83.80	0.1

4. Contractor(s): a) Ursel Systems Ltd.
1755 Woodward Drive
Ottawa, Ontario

5. 87-88 Objectives:
- Complete documentation in process at time of IRDAS termination.
- Design, build and test software for computer processing of laser profilometer data.

6. Accomplishments/Deliverables:
- Subsequent to the cancellation of the main Integrated Ice Recce system design work carried on to complete Function Requirement specification for SPOT ICE and BERGDAS to the current definition.
- The software for processing laser profilometer ice profiles for the automatic derivation of ice ridging statistics has been completed, and is ready for demonstration.

7. Problems Encountered/Resolution?
- None. The project has been terminated.

8. Publications/Reports in 87-88 or in Press:
Functional requirement spec. on SPOT ICE and BERGDAS
Final report on Laser Management System
- Both by Ursel Systems Ltd.

9. Recommendations:
- That funding be cut off for this project.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Integrated Ice Recce Systems   OERD Project Number: 67122

2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY):   257.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	78.80	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY):   78.80 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	5.0	0.1	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) =   5.00 (0.1)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) =   0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Prediction of Oil Spill Movement in Ice Laden Waters

OERD Project Number: 67126

2. Manager: A. Bealby
Address: 4905 Dufferin Street
Downsview, Ontario

Department EC/AES
Phone Number: (416) 739-4908

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	59.00	0.0
PERD As spent	59.00	0.0
EC As spent	15.00	0.3
Other As spent	0.00	0.0
Total As spent	74.00	0.3

4. Contractor(s): a) Fleet Technology Ltd., Kanata, Ontario
b) Martec Ltd., Halifax, N.S.

5. 87-88 Objectives:
- Test results on oil spill and ocean current models operating in combination.
- Data collection for assessment of oil in ice problem.

6. Accomplishments/Deliverables:
-The advanced AES oil spill model has been moved from a mainframe to a IBM PC
-A model has been developed to predict the movement and spreading of oil in medium to high concentration ice cover. This is a step forward from earlier studies (Dome; S.L. Ross et al). Using a few pieces of available data, a new empirical formulation has been derived for the spreading of oil in ice.

7. Problems Encountered/Resolution?
-Ocean current models are under development by DFO, yet at operational stage.

8. Publications/Reports in 87-88 or in Press:
a) Contract report "Users Manual", MARTEC, Inc.
b) Contract report "A methodology for computing oil spill motion in ice infested waters", Fleet Technology Ltd.
c) Venkatesh, S. 1988: "The oil spill behaviour model of the Canadian AES - Part I: Theory and model evaluation", Atmoshere - Ocean, 26:1,93-108
d) Venkatesh, S., V.R. Neralla, W. Hume, N. Parker and B. Thompson, 1988: "The oil spill behaviour model of the Canadian Atmospheric Environment Service - Part II: Evaluation of model guidance for emergency response". Atmosphere - Ocean, Vol. 26, No. 1, pp. 109-117.
e) El-Tahan, H., Venkatesh, S., Comfort, G. and Abdelnour, R.: "Prediction of oil movement in a broken ice field", paper submitted for presentation at 11th Annual AMOP Technical Seminar, June 7-9, 1988, Vancouver, B.C.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Prediction of Oil Spill Movement in Ice Laden Waters — OERD Project Number: 67126
2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 59.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	56.20	0.00	0.00	0.0	0.0	2.80

Total Panel K$ (PY): 59.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	15.0	0.3	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 15.00 (0.3)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Atlantic Storms

OERD Project Number: 67135

2. Manager: A.J. Chisholm
Address: 4905 Dufferin Street
Downsview, Ontario
M3H 5T4

Department EC/AES
Phone Number: (416) 739-4995

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	305.00	1.0
PERD As spent	323.00	1.0
EC As spent	407.00	3.4
Other As spent	0.00	0.0
Total As spent	730.00	4.4

4. Contractor(s):
   - a) McGill University; Montreal, Quebec.
   - b) UQAM; Montreal, Quebec.
   - c) Kel Research Corp.; Downsview, Ont.
   - d) J.R. Salmon; Toronto, Ont.
   - e) Alberta Research Council; Edmontom, Alta.

5. 87-88 Objectives:
The objectives for the 1987-88 period were (i) to continue the analysis of information gathered during the CASP field experiment, (ii) to provide data to researchers using CASP data, and (iii) to introduce suggestions for improved forecasts into the operational environment.

6. Accomplishments/Deliverables:
i) The CASP data analysis centre was greatly improved. Some 45 data analysis programs are now available and programs to model mesoscale and precipitation processes are under development. A joint CASP/GALE workshop was held in Virginia with about 100 Canadian and American researchers in attendance. A conceptual model of Atlantic storms was developed & explanations for its organization and evolution were proposed, comparisons have been made between rapidly deepening and non-deepening storms, it was shown that few regions within any storms are characterized by deep convection. A collaborative study with BIO has shown that variations between coastal and offshore winds can be partially explained by local topographic effects. ii) Many data requests were filled. Requests were made from several branches of AES, Bedford Institute of Oceanography, Institute Ocean Sciences, 5 Canadian universities, and 6 U.S. research institutes and universities. iii) The conceptual model of CASP storms has been presented to forecasters. A joint forecaster-researcher study on the organization and characteristics of mesoscale features has been started. Numerical modelling groups in Canada and the U.S. are using CASP data to test model assumptions and predictions.

7. Problems Encountered/Resolution?

8. Publications/Reports in 87-88 or in Press:

- Szeto, K.K., Stewart, R.E. and Lin, C.A., 1988: Mesoscale Circulations Force by Melting Snow. Part II: Application to Meteorological Features. J. Atmos.
- Stewart, R.E. and Patenaude, L.M., 1988: Rain-snow Boundaries and Freezing Precipitation in Canadian East Coast Winter Storms. Atmos.-Ocean (April).
- Macdonald, K.A., Danks, M. and Abraham, J.D., 1988: A Short-range Forecasting Experiment Conducted during the Canadian Atlantic Storms Program. Wea. Fore.
- Stewart, R.E. and Macpherson, S.A, 1988: Winter Storms Structure and Melting-Induced Circulations. Atmos.-Ocean (CASP issue).
- Steward, R.E. and Donaldson, N.R., 1988: On the Nature of Rapidly Deepening East Coast Winter Storms. Atmos.-Ocean (CASP issue).
- Donaldson, N.R. and Stewart, R.E., 1988: Precipitation North of Low Centres in Canadian Atlantic Storms. Atmos.-Ocean (CASP issue).
- Stewart, R.E., Crawford, R.W. and Donaldson, N.R., 1988: Precipitation Type Properties and Evolution in Winter Storms. Atmos. Res.
- Stewart, R.E., 1987: Mesoscale Structures in Synoptic Systems. Proc. 2nd workshop. Operational Meteorology, Halifax, 1-10.
- Walmsley, J.L. and Taylor, P.A., 1987: A Preliminary Demonstration of the Use of Boundary-layer Models of Flow in Complex Terrain for High Resolution Wind Forecasting. IUGG Congress, Vancouver.
- Stewart, R.E., 1988: Microscale, Mesoscale, and Stormscale Features in Winter Storms. Proc. 22nd CMOS Congress, Hamilton.
- Stewart, R.E., Low, T.B. and Crawford, R.W., 1988: Precipitation Types and Accretion in Winter Storms, Proc. Fourth Intl. Wkshp. Atmospheric Icing of Structures, Paris, France.
- Stewart, R.E., Donaldson, N.R., Macpherson, S.A. and Lin, C.A., 1988: Melting-induced Circulations, Frontogenesis and Cyclogenesis. Palmen Symposium on Extratropical Cyclones, Helsinki, Finland.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Atlantic Storms   OERD Project Number: 67135

2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 305.00 (1.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
13.00	0.00	40.0	1.0	0.0	270.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 323.00 (1.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
58.00	76.00	150.0	2.9	0.1	103.00	0.00	20.00	0.3	0.1	0.00

Total EC K$ (PY) = 407.00 (3.4)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Ice Dynamics Modelling OERD Project Number: 67142

2. Manager: John C. Falkingham Department EC/AES
Address: Ice Centre Environment Canada Phone Number: (613) 996-4297

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	110.00	0.0
PERD As spent	110.00	0.0
EC As spent	30.00	0.5
Other As spent	0.00	0.0
Total As spent	140.00	0.5

4. Contractor(s): a) Intera Technologies Ltd.
Calgary, Alta.
b) University of Waterloo
Waterloo, Ont.

5. 87-88 Objectives:
-Complete the evaluation study of the Regional Ice Model started the previous year. Fine-tune the model and complement software changes to make it operationally robust. Produce program design, operation and maintenance manuals.

6. Accomplishments/Deliverables:
The evaluation study was completed in May 1987. Software changes were made by Ice Centre staff and Waterloo Coop Students and the model was run operationally during the 1987-88 season. Operation and maintenance manuals and the inclusion of a current model as recommended in the evaluation are still outstanding. This work will be completed in 1988-89 with Environment Canada funding as agreed by an exchange of letters with PERD in January 1988.

7. Problems Encountered/Resolution?
Due to difficulties with other related projects, the planned work could not be completed in 1987-88. Of the $110.0K allocated,only $37.9K was actually expended on this project. By agreement, the remaining 73.1K was spent on other EC projects and is to be paid in 1988-89 by completing the project at EC expense.

8. Publications/Reports in 87-88 or in Press:
-Integral Technologies; Regional Ice Model Evaluation Report, May 87

9. Recommendations:
-Funding of the project through PERD has ceased although the project completion will not be reported until next year.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Ice Dynamics Modelling OERD Project Number: 67142

2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 110.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	110.00	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 110.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	30.0	0.5	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 30.00 (0.5)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Wind Variability in Storms OERD Project Number: 67143

2. Manager: B.R. Kerman
Address: 4905 Dufferin Street
Downsview, Ont.
M3H 5T4

Department EC/AES
Phone Number: (416) 739-4852

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	20.00	0.0
PERD As spent	20.00	0.0
EC As spent	33.00	0.2
Other As spent	0.00	0.0
Total As spent	53.00	0.2

4. Contractor(s): a) Arctic Sciences
100 Ilsley Ave.
Unit AA Dartmouth, N.S.
b) Sea Scan
RR3 Caledon, Ontario

5. 87-88 Objectives:
To recover WOTAN from Labrador Sea, analyse its data, prepare a report of exceedance statistics of wind speed for winter 86-87.

6. Accomplishments/Deliverables:
(a) Recovery of WOTAN from Labrador Sea.
(b) Report of instrument performance.
(c) Preparation of system for Ocean Storm experiment.
(d) Preparation of report on use of satellite scatterometry for measuring winds at sea.
(e) Re-engineering of prototype buoy for oil mixing experiment (Project and funding to commence in 1988).

7. Problems Encountered/Resolution?
(a) Factory defective electronics greatly reduced data capture off Labrador. System revamped and deployed off West Coast.
(b) Lack of provision of proper mount by IOS as promised caused participation in Ocean Storm experiment to be scrubbed.

8. Publications/Reports in 87-88 or in Press:
"A review of cost-benefit studies of wind scatterometry over the ocean" Sea Scan, final report, 1988.

9. Recommendations:
-The system be reinserted in the ocean as possible with co-operation from BIO/IOS. The cost be borne from the on-going project on oil mixing.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD, PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Wind Variability in Storms OERD Project Number: 67143

2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 20.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
8.70	0.00	0.0	0.0	0.0	11.30	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 20.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	25.00	8.0	0.2	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 33.00 (0.2)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Expt. on Rapidly Intensifying Cyclones-Atlantic (ERICA) OERD Project Number: 67156
2. Manager: A.J. Chisholm Department EC/AES
Address: 4905 Dufferin Street Phone Number: (416) 739-4995
Downsview, Ont.
M3H 5T4

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	0.00	0.0
PERD As spent	0.00	0.0
EC As spent	5.00	0.1
Other As spent	0.00	0.0
Total As spent	5.00	0.1

4. Contractor(s):

5. 87-88 Objectives:
-The Objective of this period was to participate in the initial planning for the experiment.

6. Accomplishments/Deliverables:
Dr. R.E. Stewart continued as a member of the ERICA Steering Committee. This committee is charged with designing and implementing the project. It is composed of 12 members including the leading American scientists in the field of rapid cyclogenesis. The Steering Committee met twice and also organized a workshop on the field phase of ERICA.

7. Problems Encountered/Resolution?

8. Publications/Reports in 87-88 or in Press:
-Draft of "Canadian ERICA Operations Plan"
-Draft of "ERICA Operations Plan"

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Expt. on Rapidly Intensifying Cyclones-Atlantic (ERICA) OERD Project Number: 67156
2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 0.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 0.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	5.0	0.1	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 5.00 (0.1)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: LNG Spill Control OERD Project Number: 67219

2. Manager: Dr. C.S. Matthias Department EC/AES
Address: 4905 Dufferin Street Phone Number: (416) 739-4448
Downsview, Ont.
M3H 5T4

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	25.00	0.0
PERD As spent	25.00	0.0
EC As spent	5.00	0.1
Other As spent	0.00	0.0
Total As spent	30.00	0.1

4. Contractor(s): a) Concord Scientific Corporation
2 Tippett Road
Downsview, Ont.
M3H 2V2

5. 87-88 Objectives: To upgrade the COBRA Hazard Assessment model.

6. Accomplishments/Deliverables:
(a) COBRA is a unique model developed in Canada for hazard assessment regarding spills of toxic liquids and gases.
(b) Concord Scientific Corporation (CSC) has won several contracts on the basis of having such a model.
(c) CSC invests a considerable amount of their own resources into COBRA development, indicating its value to the company.
(d) COBRA now has a chemical data base of 9 chemicals.

7. Problems Encountered/Resolution?
- None.

8. Publications/Reports in 87-88 or in Press:
-Alp E., Oliverio M., Lam L.H., Matthias C.S., and Bourque C.P. (1987) COBRA: A heavy gas/liquid spill and dispersion modelling system. Symposium on Major Hazards in the Transport and Storage of Pressure Liquefied Gases, Fredericton, August, 1987, (To be published in the Journal of Hazardous Materials).
-Alp E., Oliverio M., Portelli R.V., and Napier D.H. (1988) Risk Assessment in rail transportation of dangerous goods. Fifth Technical Seminar on Chemical Spills, Montreal, February, 1988.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: LNG Spill Control OERD Project Number: 67219

2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 25.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
6.00	0.00	0.0	0.0	0.0	19.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 25.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	0.00	0.00	5.00	0.1	0.0	0.00

Total EC K$ (PY) = 5.00 (0.1)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Ice and Wind on Transmission Lines — OERD Project Number: 68203

2. Manager: M. Barry — Department EC/AES
Address: Atmospheric Environment Service — Phone Number: (416) 739-4670
4905 Dufferin Street, Downsview,
Ontario M3H 5T4

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	70.00	0.0
PERD As spent	57.40	0.0
EC As spent	18.60	0.2
Other As spent	0.00	0.0
Total As spent	76.00	0.2

4. Contractor(s): a) Compusult Ltd.
333 Duckworth Street
St. John's Newfoundland

5. 87-88 Objectives: -Final development and implementation of an advanced ice and wind loading model for transmission lines and towers. -Publication of the proceedings of 3 rd int'l Workshop on the Atmospheric Icing of Structures held May 1986 in Vancouver. -Continued support to research and standards agencies such as the CEA and CSA in developing and setting standards for ice and wind load design information.

6. Accomplishments/Deliverables:
-Contract for development of the prototype ice and wind loading model was awarded. -Continued support was provided to the CEA and IEEE committees dealing with ice and wind loads.

7. Problems Encountered/Resolution?
-Contractor delays have resulted in the ice and wind load model not yet implemented, funds will be sought for implementation this FY. -Late submissions from authors has resulted in delay of publication of the proceedings until this FY.

8. Publications/Reports in 87-88 or in Press:
-Mitten, P., Makonnen, L. and Morris, R. :"Ice and Wind Model Development to the Canadian Electrical Association.", March 1988 Annual Meeting.

9. Recommendations:
-PERD funding be provided this FY for the implementation of the model.
-The submission for this project will reflect further required work.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Ice and Wind on Transmission Lines OERD Project Number: 68203
2. Department/Service: EC/AES
3. Proposed PERD Resources K$ (PY): 70.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
8.70	0.00	0.0	0.0	0.0	47.00	0.00	0.00	0.0	0.0	1.70

Total Panel K$ (PY): 57.40 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	14.6	0.1	0.0	0.00	0.00	4.00	0.1	0.0	0.00

Total EC K$ (PY) = 18.60 (0.2)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

CORPORATE PLANNING GROUP COORDINATION

SERVICE DE PLANIFICATION DU MINISTÈRE

TABLE 5

DEPARTMENT: EC | MYOP PLANNING ELEMENT: CPG | PANEL ON ENERGY R&D

OERD #	TITLE	1987-88 PROPOSED PERD		1987-88 AS SPENT K$ AND PY's																										
				INTRAMURAL PERD					EXTRAMURAL PERD						TOTAL PERD	INTRAMURAL EC RESOURCES					EXTRAMURAL EC RESOURCES						TOTAL EC	TOTAL OTHER	TASK TOTAL	
		K$	PY	O&M	Capital	Sal/Ben	S/T PY	Adm PY	Contract	G&C	Sal/Ben	SA PY	Adm PY	DSS FEES PERD	$	O&M	Capital	Sal/Ben	S/T PY	Adm PY	Contract	G&C	Sal/Ben	SA PY	Adm PY	DSS FEES EC	$	RES $	K$	PY
25100	Departmental R&D Coordination	100	1.0	40	0	30	1	0.0	91	0	30	1	0.0	0	191	0	0	0	0	0.2	0	0	40	1	0.1	0	48	0	239	1.0
	Subtotal TASK 2	100	1.0	40	0	30	0.5	0.0	91	0	30	0.5	0.0	0	191	0	0	0	0.0	0.2	0	0	40	0.5	0.1	0	48	0	239	1.0

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Departmental R&D Coordination

OERD Project Number: 25108

2. Manager: Wayne Richardson
Address: Ottawa, Ontario
K1A 0H3

Department EC/CPG
Phone Number: (819) 994-5166

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	100.00	1.0
PERD As spent	191.30	1.0
EC As spent	48.00	0.8
Other As spent	0.00	0.0
Total As spent	239.30	1.8

4. Contractor(s):
- Canadian Petroleum Association, Calgary, Alta
- Marbek, Ottawa, Ontario
- Torrie, Smith & Assoc., Ottawa, Ontario
- Brookhaven Laboratories, New York, U.S.A.
- Univ. of Waterloo, WATRF, Ontario
- Univ. of Montreal, GERAD, Quebec
- Cadham-Hayes Consultants, Ottawa, Ontario

5. 87-88 Objectives: To coordinate EC energy R&D programme within department; to assure liaison with OERD for programme/financial information; to provide liaison with OGDs, provincial, university, private sectors.

6. Accomplishments/Deliverables:
- 1985/86 EC Annual Report on Energy R&D published.
- Series of Energy Notes on important topics on energy and environment published.
- Successful workshop on Environmental Effects Monitoring in the Offshore (funding to EC/C&P Atlantic) held in St. John's, Nfld. March 15 & 16, 1988.
- Major international workshop on Incineration of Wastes and Ash Disposal (funding to NITEP programme, EC/C&P) held in Montreal, October 1 & 2, 1987.
- Organization for the Energy Workshop for the Changing Atmosphere Conference in Toronto in June 1988 was completed.
- Lab support provided to C&P Atlantic for implemention of new offshore monitoring techniques
- Planning for PERD 6.7 Committee Workshop with the Canadian Petroleum Asso.

7. Problems Encountered/Resolution?

8. Publications/Reports in 87-88 or in Press:
- Environment Canada, Energy Research & Development Programme, 1985-1986 Annual Report, Corporate Planning Group, September, 1987.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Departmental R&D Coordination OERD Project Number: 25108

2. Department/Service: EC/CPG
3. Proposed PERD Resources K$ (PY): 100.00 (1.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY) Sci./Tech.	(PY) Admin.	Contract	Contrib-ution	Sal.& Ben.	(PY) Sci./Auth.	(PY) Admin.	Fees Paid
40.00	0.00	30.0	0.5	0.0	91.30	0.00	30.00	0.5	0.0	0.00

Total Panel K$ (PY): 191.30 (1.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY) Sci./Tech.	(PY) Admin.	Contract	Contrib-ution	Sal.& Ben.	(PY) Sci./Auth.	(PY) Admin.	Fees Paid
0.00	0.00	8.0	0.0	0.2	0.00	0.00	40.00	0.5	0.1	0.00

Total EC K$ (PY) = 48.00 (0.8)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

CONSERVATION AND PROTECTION

CONSERVATION ET PROTECTION

TABLE 4

DEPARTMENT: EC   MYOP PLANNING ELEMENT: C&P   PANEL ON ENERGY R&D

OERD #	TITLE	1987-88 PROPOSED PERD		1987-88 AS SPENT K$ AND PY's																										
				INTRAMURAL PERD					EXTRAMURAL PERD					DSS FEES PERD	TOTAL PERD $	INTRAMURAL EC RESOURCES					EXTRAMURAL EC RESOURCES					DSS FEES EC	TOTAL EC $	TOTAL OTHER RES $	TASK TOTAL	
		K$	PY	O&M	Cap-ital	Sal/Ben	S/T PY	Adm PY	Cont-ract	G&C	Sal/Ben	SA PY	Adm PY			O&M	Cap-ital	Sal/Ben	S/T PY	Adm PY	Cont-ract	G&C	Sal/Ben	SA PY	Adm PY				K$	PY
122201	DRECT	906	2.0	60	0	111	1	1.0	681	0	0	0	0.0	4	856	20	0	55	1	0.5	193	0	11	0	0.0	0	279	4405	5540	3.2
122202	Sewage Treatment	101	0.0	23	42	0	0	0.0	88	0	0	0	0.0	5	157	0	0	103	3	0.0	153	0	21	1	0.0	5	281	42	480	3.0
122203	Incinerator Test & Evaluation	26	0.0	0	0	0	0	0.0	26	0	0	0	0.0	0	26	50	0	0	0	0.0	595	0	0	3	0.5	0	645	0	671	3.1
122A11	DRECT - Recycling	43	0.0	0	0	0	0	0.0	43	0	0	0	0.0	0	43	0	0	78	1	0.2	44	0	0	0	0.0	0	122	0	165	1.2
123051	Pulp and Paper	207	0.0	15	0	0	0	0.0	0	0	0	0	0.0	0	15	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	15	0.0
	Subtotal TASK 1	1283	2.0	98	42	111	1.0	1.0	838	0	0	0.0	0.0	9	1097	70	0	236	4.0	0.7	985	0	32	3.3	0.5	5	1327	4447	6871	10.5
241021	Hydrogeological Aspects of Bitumen/Heavy Oil Recovery	120	0.0	5	0	0	0	0.0	40	0	0	0	0.0	3	48	0	0	0	0	0.1	0	0	0	0	0.1	0	0	0	48	0.5
241041	Oil Sands Tailings - Water Treatment	130	0.0	0	0	0	0	0.0	104	0	0	0	0.0	14	117	0	0	0	0	0.0	10	0	0	0	0.0	1	11	556	684	0.4
241051	Treatment of Aqueous Effluents from Insitu Operations	401	2.0	90	100	86	2	0.0	107	0	0	0	0.0	11	394	30	20	172	4	0.5	0	0	43	1	0.0	0	265	511	1170	7.0
241061	Treatment of Oil/Water/Sand In Situ Sludges	200	0.0	141	10	0	0	0.0	130	0	0	0	0.0	9	290	11	12	0	1	0.0	0	0	0	0	0.0	0	23	130	443	0.0
242011	Environm'l Protec'n Criteria for Coal Mining & Proc Facil	38	0.0	2	0	0	0	0.0	35	0	0	0	0.0	0	37	0	0	3	0	0.1	0	0	9	0	0.1	0	12	15	64	0.0

TABLE 4 CONT'D
DEPARTMENT: EC　　　　MYOP PLANNING ELEMENT: C&P　　　　PANEL ON ENERGY R&D

OERD #	TITLE	1987-88 PROPOSED PERD		1987-88 AS SPENT K$ AND PY's																										
				INTRAMURAL PERD					EXTRAMURAL PERD					DSS FEES PERD	TOTAL PERD $	INTRAMURAL EC RESOURCES					EXTRAMURAL EC RESOURCES					DSS FEES EC	TOTAL EC $	TOTAL OTHER RES $	TASK TOTAL	
		K$	PY	O&M	Capital	Sal/Ben	S/T PY	Adm PY	Contract	G&C	Sal/Ben	SA PY	Adm PY			O&M	Capital	Sal/Ben	S/T PY	Adm PY	Contract	G&C	Sal/Ben	SA PY	Adm PY				K$	PY
124303	Flue Gas Desulphurization/Dev. of Recommended Water-Mgt Prac.	137	1.0	9	0	0	0	0.0	55	20	56	1	0.0	0	140	1	0	0	0	0.0	65	0	11	0	0.1	0	77	300	517	1.2
124304	FBC Technology-Assessment of Water Pollution Potential	160	0.0	10	0	4	0	0.0	137	0	0	0	0.0	2	154	25	30	126	3	0.0	0	0	0	0	0.0	0	181	0	335	2.0
124306	Advanced Coal Combustion/ Preparation Tech./Env. Imp.	132	0.0	15	0	0	0	0.0	123	0	0	0	0.0	0	138	0	0	0	0	0.0	0	0	0	0	0.0	0	0	825	963	2.9
125102	Water Supply Constraints	139	1.0	0	0	0	0	0.0	88	0	41	1	0.0	3	132	0	0	0	0	0.0	2	0	0	0	0.0	0	2	0	134	1.0
	Subtotal TASK 2	1457	4.0	272	110	90	2.0	0.0	819	20	97	2.0	0.0	42	1450	67	62	301	7.0	0.7	77	0	63	1.9	0.3	1	571	2337	4358	17.4
411011	Modelling	50	0.0	3	0	0	0	0.0	47	0	0	0	0.0	0	50	0	0	12	0	0.0	0	0	0	0	0.0	0	12	0	62	0.0
454031	Anaerobic Digestion	150	0.0	2	0	0	0	0.0	145	0	0	0	0.0	4	150	12	15	127	3	0.5	0	0	21	1	0.0	0	175	52	377	3.5
	Subtotal TASK 4	200	0.0	5	0	0	0.0	0.0	192	0	0	0.0	0.0	4	200	12	15	139	2.5	0.5	0	0	21	0.5	0.0	0	187	52	439	3.5
512021	Demonstra'n of Liquid Fuel Produc'n from Sewage Sludge	323	0.0	86	0	0	0	0.0	261	[illegible]	[illegible]	0	0.0	2	349	60	2	30	1	0.2	12	0	18	1	0.0	0	131	0	480	1.5
571011	Pollution Abatement Tecnologies	146	1.0	0	0	0	0	0.0	77	6	54	1	0.0	0	137	1	0	0	0	0.0	0	0	0	0	0.0	0	1	35	173	1.2
571141	Environmental Implications of Co-Processing	129	1.0	19	17	44	1	0.0	0	0	0	0	0.0	0	79	0	0	4	0	0.0	0	0	4	0	0.0	0	9	0	88	1.2

TABLE 4 CONT'D

DEPARTMENT: EC | MYOP PLANNING ELEMENT: C&P | PANEL ON ENERGY R&D

OERD #	TITLE	1987-88 PROPOSED PERD		1987-88 AS SPENT K$ AND PY's: INTRAMURAL PERD					EXTRAMURAL PERD					DSS FEES PERD	TOTAL PERD $	INTRAMURAL EC RESOURCES					EXTRAMURAL EC RESOURCES					DSS FEES EC	TOTAL EC $	TOTAL OTHER RES $	TASK TOTAL	
		K$	PY	O&M	Capital	Sal/Ben	S/T PY	Adm PY	Contract	G&C	Sal/Ben	SA PY	Adm PY			O&M	Capital	Sal/Ben	S/T PY	Adm PY	Contract	G&C	Sal/Ben	SA PY	Adm PY				K$	PY
571115	Impacts of NLF in Motor Vehicles	20	0.0	34	0	0	0	0.0	0	0	0	0	0.0	0	34	15	0	0	0	0.0	0	0	0	0	0.0	0	15	5	54	0.0
571116	Underground Tank Compatibility with NLF	15	0.0	3	0	0	0	0.0	13	0	0	0	0.0	0	15	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	15	0.1
	Subtotal TASK 5	633	2.0	142	17	44	1.0	0.0	351	6	54	1.0	0.0	2	614	76	2	42	1.2	0.2	12	0	22	0.6	0.0	0	156	40	810	4.0
621231	Wave Turbulence Interaction	0	0.0	65	0	0	0	0.0	0	0	0	0	0.0	0	65	10	8	243	5	0.0	0	0	0	0	0.0	0	261	0	326	4.7
621241	Shoaling Waves	24	0.0	50	0	0	0	0.0	0	0	0	0	0.0	0	50	0	14	119	2	0.0	0	0	0	0	0.0	0	133	25	208	2.3
622230	Wave Forces on Undersea Pipelines in Open Trenches	3	0.0	3	0	0	0	0.0	0	0	0	0	0.0	0	3	0	0	10	0	0.0	0	0	0	0	0.0	0	10	0	13	0.2
672206	Remote Sensing-Chronic Oil Discharges	35	0.0	4	0	0	0	0.0	25	5	0	0	0.0	1	34	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	34	0.0
672237	Integrated Hydrocarbon Monitoring	98	0.0	0	0	0	0	0.0	96	3	0	0	0.0	3	102	1	0	0	0	0.0	0	0	0	0	0.0	0	1	2	105	0.4
672238	Condensate Effects on Commercial Species	28	0.0	0	0	0	0	0.0	26	0	0	0	0.0	2	28	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	28	0.0
672239	Organic Pollutants from Flare Stacks	100	0.0	0	0	0	1	0.0	41	0	0	0	0.0	0	41	1	0	0	0	0.0	0	0	10	0	0.0	0	11	134	186	1.1
672245	Produced Water Alternatives	78	1.0	10	0	0	0	0.0	16	0	0	0	0.0	1	27	2	0	13	0	0.0	0	0	0	0	0.0	0	15	0	42	0.1

TABLE 4 CONT'D

DEPARTMENT: EC MYOP PLANNING ELEMENT: C&P PANEL ON ENERGY R&D

OERD #	TITLE	1987-88 PROPOSED PERD		1987-88 AS SPENT K$ AND PY's																												
				INTRAMURAL PERD					EXTRAMURAL PERD						TOTAL PERD	INTRAMURAL EC RESOURCES					EXTRAMURAL EC RESOURCES						TOTAL EC	TOTAL OTHER	TASK TOTAL	
		K$	PY	O&M	Cap-ital	Sal/Ben	S/T PY	Adm PY	Cont-ract	G&C	Sal/Ben	SA PY	Adm PY	DSS FEES PERD	$	O&M	Cap-ital	Sal/Ben	S/T PY	Adm PY	Cont-ract	G&C	Sal/Ben	SA PY	Adm PY	DSS FEES EC	$	RES $	K$	PY
67246	Biodegradability of Base Oils	50	0.0	3	0	0	0	0.0	50	0	0	0	0.0	2	55	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	55	0.0
	Subtotal TASK 6	400	1.0	135	0	0	1.0	0.0	254	0	0	0.0	0.0	9	405	14	22	385	7.7	0.0	0	0	10	0.3	0.0	0	431	161	997	9.2

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: DRECT

OERD Project Number: 12201

2. Manager: S.A.Ross
Address: TD&TSB/C&P
PVM, Hull, Quebec

Department EC/C&P
Phone Number: (819) 953-1192

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	906.00	2.0
PERD As spent	856.00	2.0
EC As spent	279.00	1.2
Other As spent	4405.00	0.0
Total As spent	5540.00	3.2

4. Contractor(s): N/A

5. 87-88 Objectives:

-To develop hardware, techniques, and systems to maximize opportunities for saving or recovering energy through waste reduction and recycle/reuse of waste materials.

6. Accomplishments/Deliverables:

i) There were 15 active projects reported by the DRECT program in 1987/88. Eight projects were continuation of contracts signed in previous years and seven contracts were initiated. ii) Eight projects were concluded in 1987/88. Six technical reports are currently being reviewed for publication.

7. Problems Encountered/Resolution?

-Two final project reports have been refused by the scientific authorities. Negotiations are underway with the contractors to rewrite the reports.

8. Publications/Reports in 87-88 or in Press:

1) Development of a System to Combine Solvent Recovery with Recovery of Heat from Residual Organic Wastes.
2) Recovery of Waste Proteins and Fats in the Dairy Industry.
3) Recovery of Nitrogen from Wastewater Effluent by Mechanical Compression Evaporation.
4) Thermonic: A Treatment Process for the Recovery of Chrome VI from Metal Finishing Wastewaters.
5) Product Recovery from Waste Metallurgical Dusts by Rotary Kiln Technology.
6) Precipitation - Flotation Process to Produce Marketable Concentrates of Metal from Metal Finishing Sludges.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: DRECT OERD Project Number: 12201

2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 906.00 (2.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
60.00	0.00	111.0	1.0	1.0	681.00	0.00	0.00	0.0	0.0	4.00

Total Panel K$ (PY): 856.00 (2.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
20.00	0.00	55.0	0.5	0.5	193.00	0.00	11.00	0.2	0.0	0.00

Total EC K$ (PY) = 279.00 (1.2)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
Industry/Provincial (see tbl)	0.00	0.0	0.0	4405.00	0.0

Total Other K$ (PY) = 4405.00 (0.0)

Source:	$K
Environment Québec	25
Environment Ontario	10
Nova Scotia Environment	10
Regional municipality of Halifax/ Dartmouth County of Halifax	100
Town of hay River, NWT	80

Source:	$K
Anachemia Solvents Ltd	525
CIP Inc., Gatineau, Qué	570
NOVA Pb, St Catharine, Qué	360
Domtar Inc., Hamilton, Ont	345
Hydro Québec	50
Nitrochem Ltd., Maitland, Ont	2350

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: DRECT - Recycling

OERD Project Number: 122A1

2. Manager: G. Hill/J. Myslicki
Address: TSB/IPB

Department EC/C&P
Phone Number: (613) 997-1813

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	43.00	0.0
PERD As spent	43.00	0.0
EC As spent	122.00	1.2
Other As spent	0.00	0.0
Total As spent	165.00	1.2

4. Contractor(s): N/A

5. 87-88 Objectives:
-To optimize the use of our depleting renewable and nonrenewable resources by encouraging increased recycling of hazardous waste materials in Canada.

6. Accomplishments/Deliverables:
i) Draft used-oil code of practice completed. ii) Four issues of "Resilog" were published. iii) The Canadian Waste Materials Exchange Was Operated Successfully.

7. Problems Encountered/Resolution?
-None.

8. Publications/Reports in 87-88 or in Press:
-Draft Code of Practice.
-Four issues of "Resilog".
-Six Waste Exchange Bulletins.

9. Recommendations:
-Target specific groups for the reports to ensure ???? Mising rest of recommd.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: DRECT - Recycling OERD Project Number: 122A1

2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 43.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	43.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 43.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	78.0	1.0	0.2	44.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 122.00 (1.2)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Sewage Treatment OERD Project Number: 12202

2. Manager: G.W. Speirs
Address: Wastewater Technology Centre
P.O. Box 5050
Burlington, Ontario L7R 4A6

Department EC/C&P
Phone Number: (416) 336-4745

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	101.00	0.0
PERD As spent	157.00	0.0
EC As spent	280.50	3.0
Other As spent	42.00	0.0
Total As spent	479.50	3.0

4. Contractor(s):

M. Hribljan
696 Powell Ct.
Burlington

Enviropure Inc.
244 Mountain Pk
Hamilton, Ont

Canviro Consultants Ltd.
Div. of CH2M-Hill Engin.
180 King St. S, Suite 600
Waterloo, Ont N2J 1P8

5. 87-88 Objectives: i) demonstrate energy savings in wastewater treatment using automated control; ii) retrofit and apply the methods at a full-scale municipal wastewater treatment plant; iii) disseminate the results to government agencies, consulting & design engineers, and plant operating staff.

6. Accomplishments/Deliverables:
i) Retrofitted Tillsonburg municipal wastewater treatment plant was used to provide parallel comparison of automated/manual operation for energy savings and improved performance; ii) Structured experimentation conducted with data confirming aeration energy savings in the order of 10 to 35 % depending upon plant operating configuration and dissolved oxygen setpoint level; iii) Further investigation of instrumentation and control equipment O&M requirements; iv) Aeration controller software modified to control DO in all aeration basins; v) Aerator efficiency at a number of operating conditions confirmed using off-gas monitoring equipment; vi) Protocol-based testing of U.S. EPS to share and maximize project results continued. viii) Technical exchange of results with researchers from Sweden carried out.

7. Problems Encountered/Resolution?
Structured experimental plan delayed due to plant process upsets beyond WTC control, sludge hauling and land disposal disruptions due to saturated soil conditions at farm sites, and plant equipment problems.

8. Publications/Reports in 87-88 or in Press:
General presentation of results made at BIOQUAL Conference, Montreal/Oct, 1987 and as part of pre conference workshop on aeration control at WPCF annual conference, Philadelphia/Oct, 1987. Results from plant operation audits presented at Annual WPCF conference, Philadelphia/Oct, 1987 and to Annual Instrument Society of America Conference, Anaheim, CA/Oct, 1987. Progress reports to the U.S. EPA.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Sewage Treatment OERD Project Number: 12202

2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 101.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY) Sci./Tech.	(PY) Admin.	Contract	Contrib-ution	Sal.& Ben.	(PY) Sci./Auth.	(PY) Admin.	Fees Paid
22.60	42.00	0.0	00.0	0.0	87.80	0.00	0.00	0.0	0.0	4.60

Total Panel K$ (PY): 157.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY) Sci./Tech.	(PY) Admin.	Contract	Contrib-ution	Sal.& Ben.	(PY) Sci./Auth.	(PY) Admin.	Fees Paid
0.00	0.00	102.5	2.5	0.0	153.00	0.00	20.50	0.5	0.0	4.50

Total EC K$ (PY) = 280.50 (3.0)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
Inst. Testing Service Inc.	42.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 42.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Incinerator Test & Evaluation OERD Project Number: 12203

2. Manager: A. Finkelstein
Address: PVM, Hull
Quebec

Department EC/C&P
Phone Number: (819) 953-1110

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	26.00	0.0
PERD As spent	26.00	0.0
EC As spent	645.00	3.1
Other As spent	0.00	0.0
Total As spent	671.00	3.1

4. Contractor(s): Lavalin Inc. / Toronto, Ont
Energy & Environmental Research Company, Irvine, CA

5. 87-88 Objectives: The Increased popularity of municipal refuse incinerators has presented a number of environmental and health concerns. In particular, it has been recognized that unless incinerators are properly designed, controlled and operated, the emission of toxics in fly ash and flue gases may be substantial. NITEP has been designed to address these and future concerns pertaining to municipal solid waste incineration.

6. Accomplishments/Deliverables:
To date, NITEP has generated significant outputs in terms of incinerator technological capabilities, new air pollution control technologies and new incinerator design concepts for improved combustion. Testing on the first of these technologies (two-stage combustion system) was successfully completed with detailed reports published in Sept. 1985. Almost 3000 copies of the report have already been issued and approximately 500 organizations and individuals have requested placement on the NITEP update newsletter. In addition, a 16 min semi-technical document on two-stage systems has been prepared and distributed Testing of two "state-of-the-art" air pollution control technologies was successfully completed in Sept '85. Results were published in Sept. '86 and indicated that this technology can significantly reduce toxic emissions from this type of combustion source. A 12 min semi-technical documentary film on the technologies has been prepared.
After extensive flow model studies were completed in '85 a new furnace combustion chamber design was developed for a mass burning incinerator. At a cost in excess of $2 M, the furnace on one of the incinerators at the Quebec Urban Community facility was rebuilt in accordance with flow model study findings. Modifications were complete in March '86 with $1.2 M test of this design completed by July '86. A report on the findings is expected by May'88. Results of

7. Problems Encountered/Resolution?

8. Publications/Reports in 87-88 or in Press:
The National Incinerator Testing & Evaluation Program, "Mass Burning Incinerator Technology", EPS 3/UP/3.
the design modification indicate that a significant reduction in both organic and particulates emissions can be achieved through good design and operation. A 15 min semi-technical documentary film on mass buring technology has also been prepared.
Currently the third phase of NITEP is well underway at the 2000 ton/day Mid-Connecticut Recource Recovery facility in Hartford, Conn. The facility being tested is a third generation design, refuse derived fuel incinerator technology. This project is being co-funded by U.S. EPA and considerable support is being provided by the private sector through Combustion Engineering, the owner operator of the facility. Testing of this Technology will get underway in the summer of '88.
In cooperation with private industry, municipalities and provincial agencies a "real time" combustion diagnostic and environmental monitoring (DEMO) system is being developed. The system will be deisgned to be integrated into computerized plant operations; allowing plant equipment to respond to process changes instantaneously. DEMO will be a "state-of-the-art" system employing the latest computer technology to maximize plant output by increasing efficiency and reduce emissions by improving combustion. The development of DEMO will be an ongoing activity and one of the cornerstones of NITEP. The first phase of developement of this system was begun in March '85 and successfully demonstrated during the Quebec City tests mentioned above. The second phase development is cheduled for the late summer of 1988.
Some specific outputs are: preliminary tender evaluations completed Sept./88; $1.3 M contract awarded in March'88; international conference Oct 1-2/87 on Municipal Solid Waste Incineration in Montreal; embarked on a major program on ash residue - 3 year program (210K 88/89).

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Incinerator Test & Evaluation OERD Project Number: 12203

2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 26.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	26.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 26.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
50.00	0.00	0.0	0.0	0.0	595.00	0.00	0.00	2.6	0.5	0.00

Total EC K$ (PY) = 645.00 (3.1)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Pulp and Paper   OERD Project Number: 12305

2. Manager: J.Betts/J.Haskill/G.Das   Department EC/C&P
Address: 13th floor, PVM   Phone Number: (819) 997-3714
Hull, Quebec

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	207.00	0.0
PERD As spent	15.30	0.0
EC As spent	0.00	0.0
Other As spent	0.00	0.0
Total As spent	15.30	0.0

4. Contractor(s): PAPRICAN, Pointe Claire, Que
Revere Copper, Rome, N.Y.

5. 87-88 Objectives: i) Complete process simulation trials for kraft mill applications. ii) Complete economic analysis of heat pump applications for groundwood and kraft mills. iii) Produce report.

6. Accomplishments/Deliverables:
Process simulations of heat pump applications to kraft mills using PAPMOD computer program. Economics of selected mills conducted to assess applicability to industry.

7. Problems Encountered/Resolution?
The Sludge Dewatering of Pulp and Paper Sludges component was cancelled.

8. Publications/Reports in 87-88 or in Press:
Final report on Heat Pumps for Waste Heat Recovery in the Pulp and Paper Industry to be published in 88/89.

9. Recommendations:

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Pulp and Paper OERD Project Number: 12305

2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 207.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY) Sci./Tech.	(PY) Admin.	Contract	Contribution	Sal.& Ben.	(PY) Sci./Auth.	(PY) Admin.	Fees Paid
15.30	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 15.30 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY) Sci./Tech.	(PY) Admin.	Contract	Contribution	Sal.& Ben.	(PY) Sci./Auth.	(PY) Admin.	Fees Paid
0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 0.00 (0.0)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Hydrogeological Aspects of Bitumen/Heavy Oil Recovery   OERD Project Number: 24102

2. Manager: Gary Grove/V. Marwaha   Department EC/C&P

Address: EC/National Hydrology Research Cntr   Phone Number: (306) 975-5741
11 Innovation Boulevard
Saskatoon, Sask., S7N 3H5

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	120.00	0.0
PERD As spent	48.05	0.0
EC As spent	0.00	0.5
Other As spent	0.00	0.0
Total As spent	48.05	0.5

4. Contractor(s): a) Stanley Associates Engineers Ltd.
Edmonton, Alberta
b) Alberta Research Council
4445 Calgary Trail South
Edmonton, Alberta T6H 5R7

5. 87-88 Objectives: i) To validate existing monitoring data using suitable mathematical & statistical techniques. ii) To evaluate the predictive capabilities of the ARC model. iii) A critical assessment & review of the existing studies pertaining to regional hydrogeology, bore hole data, & drilling/exploration data pertaining to geo-technical studies. iv) Identification of the major hydrogeologic concerns associated with UTF and ways to address them.

6. Accomplishments/Deliverables:
i) Industry - government technical seminars were held in June and September 1987 at which the results of the Environment Canada/Alberta Research Council (ARC) and Alberta Environment/ARC studies on deep well disposal were presented and discussed. A steering committee and a technical committee with representatives from C&P, Alberta Environment, ARC, ERCB, and the Canadian Petroleum Association were formed as a result of these seminars to review proposed and completed work for this project and to advise DOE on its direction. ii) A contract to validate existing deep well monitoring data and evaluate the capability of the ARC model to predict effects from active oil sands/heavy oil wastewater injection wells was initiated in March, 1988. iii) A comprehensive mathematical model was developed to describe all the relevant processes associated with the UTF operations. iv) Generally, there is a wealth of data at the detail and local scales. Data availability and knowledge about the subsurface decreases dramatically once outside the areas covered by present AOSTRA program. v) In order to identify the magnitude of the environmental effects of the UTF operations on the subsurface, there is a need to use predictive modelling of the respective processes. vi) A comprehensive research program was presented.

7. Problems Encountered/Resolution?

-Concerns about certain aspects of this project such as the lack of verification of existing monitoring data and the need for more sophisticated modelling work were addressed by establishing steering and technical committees to advise DOE on the work.

8. Publications/Reports in 87-88 or in Press:

-Intera Technologies Ltd., 1987. "Feasibility Study for a Field Sampling Program to Monitor Impacts Resulting from In-situ Heavy Oil Subsurface Disposal Practices". NHRI Contribution No. 88001, 802 pp., 4 app.

9. Recommendations:

-Reviewed existing borehole data from ERCB AOSTRA and ARC, developed comprehensive mathematical representation to describe all the relevant processes associated with the Underground Test Facility (UTF) operations and prepared a 5 year research program.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Hydrogeological Aspects of Bitumen/Heavy Oil Recovery — OERD Project Number: 24102
2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 120.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
5.10	0.00	0.0	0.0	0.0	40.05	0.00	0.00	0.0	0.0	2.90

Total Panel K$ (PY): 48.05 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.0	0.1	0.00	0.00	0.00	0.3	0.1	0.00

Total EC K$ (PY) = 0.00 (0.5)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Oil Sands Tailings - Water Treatment

OERD Project Number: 24104

2. Manager: B. Thompson/V. Marwaha
Address: Environment Canada
4999-98 Avenue
Edmonton, Alberta

Department EC/C&P
Phone Number: (403) 468-8008

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	130.00	0.0
PERD As spent	117.00	0.0
EC As spent	11.00	0.4
Other As spent	556.00	0.0
Total As spent	684.00	0.4

4. Contractor(s): a) Bromley Engineering
10532-110 Street
Edmonton, Alberta T5H 3C5
b) UMATAC Industrial Processes
210 - 2880 Glenmore Trail S.E.
Calgary, Alberta T2C 2E7

5. 87-88 Objectives: i) Preform tests examining effects of variables on bench scale filter performance. ii) To experimentally determine the quantity of oil recovered using bench scale apparatus by applying either individual or combined waste streams. iii) To characterize the aqueous, gaseous, and solid effluents and suggest suitable methods for their disposal. iv) To assess the economic feasibility of the process. v) Provide scale up data for 5 ton/hr. plant.

6. Accomplishments/Deliverables:
i) Designed upflow columns. ii) Performed experiments with decreased flow rate and coagulant to examine effects of retention time and dosage on filter performance. iii) Performed coagulation jar tests to determine effects of energy input, retention time and polymer selection on solids destabilization. iv) Developed detailed design for agitation and upflow filtration experiments. v) Performed economic feasibility analysis of filtration as compared to other options. vi) The process is capable of disposing oily wastes in an environmentally acceptable manner. It completely recovers the waste oil. vii) 17 different wastes were tested at the bench scale test unit. viii) Detailed characterization of effluents from 17 wastes was completed. ix) 400 tons of waste sludges were processed in the pilot plant. x) Detailed characterization of effluents from pilot plant was completed. xi) Economic assessment of the operation was completed.

7. Problems Encountered/Resolution?
-Delays in getting DSS contract.

8. Publications/Reports in 87-88 or in Press:

-"DSS Tailing Pond Study Information Brief 1", March 1988, D. Bromley Engineering (1983) Ltd., Interim report for EC

-"Assessment of Taciuk Processor Oil Sands Technology to Treat Heavy Oil Prodction Wastes", Marawaha, V., W. Taciuk, L.R. Turner and A.E. George presented at CPANS/APCA Conference, Calgary May 16-17, 1988

-"Demonstration of the Taciuk Processor to Treat Oil Wastes, Emulsions, Sludge and Spills" , prepared by EC, EMR, SSC and AOSTRA, July 88.

-"Reasearch into Treatment and Reuse of Tar Sands Tailings Pond Water as Cooling Tower Make-up Water, Part II - Phase B", D. Bromley Engineering (1983) Ltd., prepared for EC, July 88

-"Fluid Rock Interaction Summary Report", M.M. Dillon Ltd prepared for EC, May 1988.

-"Feasibility Study to Determine the Possible Impact on Subsurface Environment of Future Bitumen Recovery at AOSTRA Underground Test Facility, ARC prepared for EC March 88

9. Recommendations:

-Study to continue as per contract.

-To demonstrate the technology on a commercial scale.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Oil Sands Tailings - Water Treatment   OERD Project Number: 24104
2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 130.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	103.50	0.00	0.00	0.0	0.0	13.50

Total Panel K$ (PY): 117.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	10.00	0.00	0.00	0.4	0.0	1.00

Total EC K$ (PY) = 11.00 (0.4)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
DSS-UP, AOSTRA, EMR	35.00	0.0	0.0	521.00	0.0

Total Other K$ (PY) = 556.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Treatment of Aqueous Effluents from Insitu Operations   OERD Project Number: 24105
2. Manager: J.W. Schmidt   Department EC/C&P
Address: Wastewater Technology Centre   Phone Number: (416) 336-4541
P.O. Box 5050
Burlington, Ontario

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	401.00	2.0
PERD As spent	394.10	2.0
EC As spent	265.00	5.0
Other As spent	511.30	0.0
Total As spent	1170.40	7.0

4. Contractor(s): a) Dearborn Environmental Consultants, b) 603928 Ontario Ltd. c) Monenco Consultants, d) C&M Engineering, e) Saskatchewan Potash Corporation, f) Agat Laboratories g) Ian Martin Associates, h) Angus Employment Ltd. i) E. Barresi.

5. 87-88 Objectives: i) Prepare reports on characterization work on produced waters. ii) Complete the reports on pilot scale field evaluation of oil and suspended solids removal by granular media filtration. iii) Complete the report on bench and pilot scale evaluation of oil-in-watermonitors for produced water. iv) Demonstrate vapour compression evaporation technology for removal of total dissolved solids.

6. Accomplishments/Deliverables:
i) Summary report on produced water characteristics from 20 heavy oil sites has been drafted. Data provided to ERCB and Alberta Environment for decision making purposes. ii) Draft reports on the pilot scale field evaluation of granular media filtration were prepared. iii) A draft report on the bench and pilot scale evaluation of oil-in-water monitors in the field has been prepared. iv) Joint industry-government field trials on filtration and vapour compression evaporation (VCE) have been completed with the report expected by October 1989. Paper highlighting main findings of field trials was presented at the Canadian Heavy Oil Association Technical Meeting in Calgary. v) In-house pilot scale work on cross flow microfiltration for removal of oil and suspended solids was initiated. vi) In-house bench-scale electrodialysis work for removal of total dissolved solids was initiated in preparation for undertaking Phase II of the joint industry-government program.

7. Problems Encountered/Resolution?
-Significant scaling problems were encountered during the VCE pilot tests. These problems were resolved by developing and demonstrating a pre-treatment scheme. Membrane fouling problems encountered during the in-house work

on electrodialysis are being addressed.

8. Publications/Reports in 87-88 or in Press:

-Zaida, S.A., Kok, S. and Schmidt, J.W. :"The Use of Vapour Compression Evaporation for Removing Total Dissolved Solids from Produced Water", Presented at the Heavy Oil and Oil Sands Technical Symposium, Challenges and Innovations - 1988, March 16, 1988.

-Rogers, D.R. :"Characterization of the Organic Content of EOR Produced Water" Unpublished Report No. WTC-PC-1-1987, Wastewater Technology Center,1987.

-Ribo, J.M. :"Literature Review and Evaluation of Methodologies for the Characterization of Aqueous Effluents from Oil Recovery Processes", Unpublished Report No. WTC-PC-2-1987, Wastewater Technology Center, 1987.

-Ribo, J.M. :"Evaluation and Development of Methodologies and Protocals for the Analysis of Aqueous Effluents from In-Situ Oil Recovery Operations: Experimental Program", Unpublished Report No. WTC-PC-3-1987, WTC 1987.

-Ribo, J.M. :"Characterization of Produced Water from In-Situ Oil Recovery Operations", Unpublished Report No. WTC-PC4-1987, WTC 1987.

-Ribo, J.M. and Rogers, D. :"Characterization of Six EOR Produced Water Samples from In-Situ Oil Recovery Operations", Unpublished Report No. WTC-PC-5-1987, Wastewater Technology Center, 1987.

9. Recommendations:

-The project, as outlined, will be continued.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Treatment of Aqueous Effluents from Insitu Operations OERD Project Number: 24105
2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 401.00 (2.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
90.10	100.00	86.0	2.0	0.0	107.40	0.00	0.00	0.0	0.0	10.60

Total Panel K$ (PY): 394.10 (2.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
30.00	20.00	172.0	3.5	0.5	0.00	0.00	43.00	1.0	0.0	0.00

Total EC K$ (PY) = 265.00 (5.0)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
AOSTRA and Industry	439.00	0.0	0.0	72.30	0.0

Total Other K$ (PY) = 511.30 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Treatment of Oil/Water/Sand In Situ Sludges
OERD Project Number: 24106

2. Manager: R. Scoggins/J. Witteman
Address: Ottawa, Ontario, K1A 0H3
& Regina, Saskatchewan, S4P 3R4
Department EC/C&P
Phone Number: (819) 997-1123

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	200.00	0.0
PERD As spent	290.40	0.0
EC As spent	23.00	0.6
Other As spent	130.00	0.2
Total As spent	443.40	0.8

4. Contractor(s): a) Dr. V.O. Biederbeck, Agri. Cnd, Swift Current, Sask
b) Tricil Ltd., Mississauga, Ontario

5. 87-88 Objectives: - Determine the potential for land treatment of heavy oil sludge and diesel invert-based drilling residues as a enviro-agrono acceptable management practice. - Determine the fate and persistence of PAH's and HNC's in heavy oil waste applied to land. - Demonstrate a novel process for oil recovery from waste oil sludges.

6. Accomplishments/Deliverables:
i) Determine the environmental acceptability of oily waste land treatment as management practice has had substantial influence on the content of new guidelines. Results of the diesel invert drilling mud residue land treatm research suggest that this type of waste on drilling leases is not enviro. acceptable. Resulting from this, Alb. Waste Mgt Com., chaired by ERCB examines options.

7. Problems Encountered/Resolution?
-Both the biometer flask and microsome fate studies were delayed by 6 months due to problems with the company contracted to supply 14C labelled chemicals.

8. Publications/Reports in 87-88 or in Press:
-Tricil report entitled "Development of a Process for Oil Recovery from Waste Oil Sludges", EC draft report, Nov 87
-WTC report entitled "The Persistence and Fate Of Aromatic Constituents of Heavy Oil Production Waste Applied to Soil: An Interim Status Report", Apr/88
-Conference Paper: "Environmental Acceptability and Feasibility of Land Treatment of Diesel Invert-based Drilling Residues in the Foothills of Alberta" (Authors: R. Scoggins, D. McCoy & J. Ashworth)
-Conference Paper: "Environment Canada Research on Land Treatment of Petroleum Waste" (Authors: T. Bulman & R. Scoggins)
Air Pollution Control Association (APCA) Conference in Texas, June 88.

9. Recommendations:
-The project proceed to gather more environmental data which will allow guidelines to be drafted for the application of oily waste to land.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Treatment of Oil/Water/Sand In Situ Sludges — OERD Project Number: 24106
2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 200.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY) Sci./Tech.	(PY) Admin.	Contract	Contribution	Sal.& Ben.	(PY) Sci./Auth.	(PY) Admin.	Fees Paid
141.00	10.00	0.0	0.0	0.0	130.40	0.00	0.00	0.0	0.0	9.00

Total Panel K$ (PY): 290.40 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY) Sci./Tech.	(PY) Admin.	Contract	Contribution	Sal.& Ben.	(PY) Sci./Auth.	(PY) Admin.	Fees Paid
11.00	12.00	0.0	0.6	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 23.00 (0.6)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
CPA/ERAC Alberta Environment	130.00	0.0	0.0	0.00	0.2

Total Other K$ (PY) = 130.00 (0.2)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Environm'l Protec'n Criteria for Coal Mining & Proc Facil.
OERD Project Number: 24201

2. Manager: Blakeman, Ferguson & Kelso
Address: 13th floor, PVM
Hull, Quebec
Department EC/C&P
Phone Number: (819) 953-1105

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	38.00	0.0
PERD As spent	36.80	0.0
EC As spent	12.30	0.3
Other As spent	15.00	0.5
Total As spent	64.10	0.8

4. Contractor(s):
a) Norecol Environmental Consultants
Vancouver, B.C. V6E 3J7
b) M. Ross Consultant
Vancouver B.C. V7B 1W2
c) W.B. Barrie & Assoc.
412, 3rd Avenue, Ottawa, Ont. K1S 2K7
d) T & H Printing Ltd.
5359 Canotek Rd., Ottawa Ont.

5. 87-88 Objectives: i) Determine the effectiveness of aquatic macrophytes in removing nitrogen compounds from coal mine waste waters. ii) Identify and quantify nutrient content of SEBC coal mine waste waters. Develop prediction techniques for nitrogen and phosphorus release from coal mines. iii) Prepare and print "Wrap Up" Environmental Protection Criteria Report. iv) Contribute to printing and distribution of proceedings and Acid Mine Drainage Seminar.

6. Accomplishments/Deliverables:
i) Export of Nutrients from Surface Coal Mines - Nutrient releases from SE BC coal mines found to be generally less than predicted by existing model. Model to be revised to enhance its capability. May reduce time required for future mine permit process. ii) Determination of the effectiveness of duckweed in removing nitrogen compounds from wastewaters (Phase I - coal mine wastewater treatment options). iii) Determination of the effectiveness of emergent aquatic plants in removing nitrogen compounds from wastewaters (Phase II - coal mine wastewater treatment options). iv) Environmental Protection Criteria. State of the art (BPT) environment protection equipment/practices in use at Canadian coal mines have been identified which enable operators to meet existing air, water and reclamation requirements. v) Recent research and development projects pertaining to the prediction, prevention and treatment of AMD from Canadian and US coal mines have been reported on and distributed.

7. Problems Encountered/Resolution?

8. Publications/Reports in 87-88 or in Press:

-"Potential Coal Mine Wastewater Treatment Options"- EC Manuscript MS 87-03 March 1987. Norecol Environmental Consultants Ltd.

-"Potential Coal Mine Wastewater Treatment Options-II: Emergent Aquatic Plants EC Manuscript MS 87-05,March 1987. Norecol Environmental Consultants Ltd.

-"The Export of Nutrients from Surface Coal Mines", EP Regional Report 87 - 12 by K. D. Furguson and S. M. Leask, March 1988.

-State of the Art Environmental Protection Practice in the Canadian Coal Industry, W.B. Barrie and Associates (In editing - to be published in MS series).

-"Proceedings of Acid Mine Draining Seminar/Workshop", Halifax, N.S. March 23-26, 1987 Environment Canada/Transport Canada EN 40-11-7/1987.

-Water Use in Coal Mining Industry and its Influence on Groundwater in Western Canada, NHRI Paper No.38, IWD Technical Bulletin No. 154 by W.B.Barrie and C.H. Carr.

9. Recommendations:

-Based on the success of bench scale tests on use of aquatic plants for nitrogen removal the pilot scale trials will begin in June 1988.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Environm'l Protec'n Criteria for Coal Mining & Proc Facil. OERD Project Number: 24201
2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 38.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
1.60	0.00	0.0	0.0	0.0	35.20	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 36.80 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	3.3	0.0	0.1	0.00	0.00	9.00	0.1	0.1	0.00

Total EC K$ (PY) = 12.30 (0.3)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
S.E.B.C. Coal Companies Est.	5.00	0.0	10.0	0.00	0.5

Total Other K$ (PY) = 15.00 (0.5)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Flue Gas Desulphurization/Dev. of Recommended Water-Mgt Prac. OERD Project Number: 24303
2. Manager: G.G. Ross / Electric Power Section Department EC/C&P
Address: Industrial Programs Branch
13th floor, PVM
Hull, Quebec
Phone Number: (819) 997-1222

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	137.00	1 0
PERD As spent	139.90	1.0
EC As spent	77.20	0.2
Other As spent	300.00	0.0
Total As spent	517.10	1.2

4. Contractor(s): a) Ontario Hydro, Research Division
b) Monenco Consultants, Calgary, Alberta

5. 87-88 Objectives:
i) Assess environmentally appropriate handling/disposal procedures for furnace sorbent injection (FSI) solid wastes.

6. Accomplishments/Deliverables:
i) Co-funding was arranged among the Canadian Electrical Association (CEA), Ontario Hydro and Environment Canada (PERD) for a major co-operative research project involving Ontario Hydro's furnace sorbent injection (FSI) pilot plant and related studies. PERD leverage in this study is approximately 1:10.
ii) As a component of i) above, preliminary work on FSI waste characteristics and disposal procedures has been completed under PERD funding. The study will continue in FY 88/89 under CEA funding only. The results will influence waste disposal requirements for Saskatchewan Power (SHAND), Ontario Hydro (Nanticoke and New Brunswick Power (Dalhousie) FSI systems.
iii) Information from previous PERD FGD studies provided the basis for EC's technical position, review and influence on Ontario Hydro's FGD Program Environmental Assessment.

7. Problems Encountered/Resolution?
-Co-funding from CEA made 25K available from budget for FSI waste study, which was directed to fund other work in flue gas emissions control by NHRI (groundwater impacts), RRETC (air emissions characterization) and MONENCO (waste Mgt)

8. Publications/Reports in 87-88 or in Press:
-Ontario Hydro, "Characterization of Solid Wastes from Limestones and Related Sorbent Injection Processes for Acid Gas Control", No717 g620, Mar/88

9. Recommendations:
-Commitments to install FGD systems in Ontario and FSI systems in Saskatchewan justify continued research in flue gas emissions control (see Project #24306).

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Flue Gas Desulphurization/Dev. of Recommended Water-Mgt Prac. OERD Project Number: 24303
2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 137.00 (1.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY) Sci./Tech.	(PY) Admin.	Contract	Contribution	Sal.& Ben.	(PY) Sci./Auth.	(PY) Admin.	Fees Paid
8.90	0.00	0.0	0.0	0.0	55.00	20.00	56.00	1.0	0.0	0.00

Total Panel K$ (PY): 139.90 (1.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY) Sci./Tech.	(PY) Admin.	Contract	Contribution	Sal.& Ben.	(PY) Sci./Auth.	(PY) Admin.	Fees Paid
1.00	0.00	0.0	0.0	0.0	65.00	0.00	11.20	0.1	0.1	0.00

Total EC K$ (PY) = 77.20 (0.2)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
Ontario Hydro	300.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 300.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: FBC Technology-Assessment of Water Pollution Potential

OERD Project Number: 24304

2. Manager: G.G. Ross

Address: Industrial Programs Branch
13th Floor, PVM
Hull, Quebec

Department EC/C&P
Phone Number: (819) 997-1222

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	160.00	0.0
PERD As spent	153.70	0.0
EC As spent	181.00	2.8
Other As spent	0.00	0.0
Total As spent	334.70	2.8

4. Contractor(s): a) Dearborn Environmental Consulting Service, Mississauga,

5. 87-88 Objectives:
i) Phase II of study of technical options for disposal of FBC solid wastes;
ii) Publish/distribute report on wastewater characteristics of FBC wastes.

6. Accomplishments/Deliverables:
i) Improved disposal procedures were demonstrated at the Chatham FBC unit disposal site. A 30% waste volume reduction has been achieved, and the waste has attained low permeability ($K = 1 * 10^{-6}$ cm/s) and high unconfined compressive strength (2500 kPa). As a result, N.B. Power has begun modifying its disposal procedures to gain environmental, operational and cost benefits demonstrated in the study. N.S. Power and CEA has committed to co-funding with EC, further work on disposal procedures at the Chatham site during FY 88/89. The high level of cooperation shown by Canadian Electric Utilities, Provinces and the CEA in this work indicates recognition of benefits to be derived from work
ii) The "Wastewater Characteristics" report indicates that relatively simple treatment options are available to eliminate toxicity of FBC wastewaters;
iii) The National Hydrology Research Institute (NHRI) facility for indoor aquifer testing (FIAT) was completed, and will be used for determining interactions between FBC waste and an aquifer.

7. Problems Encountered/Resolution?
-Operating difficulties at the Chatham fluidized bed combustor itself prevented completion of all aspects of the "Technical Options" study. Alternate tasks were substituted and study extended into FY 88/89.

8. Publications/Reports in 87-88 or in Press:
-Dearborn Environmental Consulting Services, "Prediction of Wastewater Characteristics from Alkaline Combustion Wastes", prepared for Environment Canada, Report No. EPS 3/PG/77, March 1988.

9. Recommendations:
-Federal/Provincial priorities in SOx and NOx control, and capability of FBC to achieve this, suggest continued strong support for research in this area.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: FBC Technology-Assessment of Water Pollution Potential

OERD Project Number: 24304

2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 160.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
9.90	0.00	4.4	0.0	0.0	137.30	0.00	0.00	0.0	0.0	2.10

Total Panel K$ (PY): 153.70 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
25.00	30.00	126.0	2.8	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 181.00 (2.8)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Advanced Coal Combustion/ Preparation Tech./Env. Imp.
OERD Project Number: 24306
2. Manager: H.A. Bambrough
Department EC/C&P
Address: Industrial Programs Branch
13th Floor, PVM, Hull Quebec
Phone Number: (819) 953-1124

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	132.00	0.0
PERD As spent	137.70	0.0
EC As spent	0.00	0.1
Other As spent	825.00	2.8
Total As spent	962.70	2.9

4. Contractor(s):
a) Ontario Hydro, Research Division
b) Dobson Reasearch Laboratory
c) Canadian Electrical Association (CEA)
d) Energy and Environmental Research Corp (EERC)

5. 87-88 Objectives: i) Ascertain and optimize parameters controlling neutralization of SO2 in pilot scale furnace experiments, by use of calcium - based slurries. ii) Develop mathematical relationship between air flow, heat input, gas temperature and heat transfer, for use in full-scale furnace design, necessary for effective implementation of NOx and SOx reduction technology. iii) Assess NOx and SOx reductions on the modified Steinmuller burner.

6. Accomplishments/Deliverables:
i) The CEA's interim report shows SO2 captures in the range of 50-68%,using a 40% aqueous slurry of Ontario limestone, at Ca/S ratios of 1.5-3.0. The pollutant removal rates were directly related to Ca/S ratio and to a lesser extent, to temperature at the point of injection, degree of atomization, and relative axial velocity of slurry droplet with respect to gas mass velocity. It was discovered that injecting the slurry co-currently with gas flow, with a mean slurry droplet size of 25 um, the removal efficiency was not seriously affected by temperature in the range 1100-1350 C. This is an important finding as it supports the implementation of furnace injection of sorbent, on full-scale boilers which operate at varying loads and hence varying furnace gas temperatures. ii) Model predictions for the variable noted in objectives include : a) the existing real-life low NOx air distribution arrangements will not have detrimental effects on boiler life or performance for the tangentially-fired boiler arrangements. b) the SO2 injection ports in the full-scale unit are in a region of excessively high gas temperature for optimal SO2 reduction at the full load condition. Hence design changes will be implemented on future boilers to optimize SO2 reduction. iii) The measurements at Gagetown for NOx and SOx emissions were taken in association with an IEA study to evaluate various low NOx burner designs on boilers at other test facilities.

The Gagetown results will be compared to determine removal efficiency.

7. Problems Encountered/Resolution?

-For the CEA/EERC modelling work, some problems were experienced with flow visualization in the lab model. This was resolved by altering the visible oil droplet sizes. Some instability was experienced with the Steinmuller design at Gagetown due to carbon carry-over. This has yet to be resolved.

8. Publications/Reports in 87-88 or in Press:

-"Sorbent Slurry Injection for SO2 Control", CEA 712-G-619, March 1988, Canadian Electrical Association, Montreal, PQ.

-"Dimensional Model Evaluation of Fine/Temparature Histories of Combustion Product in a Coal-Fired Utility Boiler" - Canadian Electrical Association/ EERC, March 1988.

-Draft report of CFB Gagetown measurement evaluations currently under review by EMR. Final report to be issued by EMR in Fall 1988.

9. Recommendations:

-The federal government should continue its support of R&D dedicated to reduction of air pollutants emitted by major combustion sources.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Advanced Coal Combustion/ Preparation Tech./Env. Imp. OERD Project Number: 24306
2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 132.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
14.70	0.00	0.0	0.0	0.0	123.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 137.70 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.1	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 0.00 (0.1)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
Ontario Hydro	825.00	0.0	0.0	0.00	2.8

Total Other K$ (PY) = 825.00 (2.8)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Water Supply Constraints OERD Project Number: 25102

2. Manager: P.J. Renolds Department EC/C&P
Address: Water Planning & Management Phone Number: (819) 953-1514
IWD, 9th floor, PVM, Hull, Quebec

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	139.00	1.0
PERD As spent	132.00	1.0
EC As spent	1.85	0.0
Other As spent	0.00	0.0
Total As spent	133.85	1.0

4. Contractor(s): ACRES International Ltd., 5259 Dorchester Rd.,
P.O. Box 1001, Niagara Falls, Ont L2E 6W1

5. 87-88 Objectives: i) to improve the grpahics (visual result presentation) module; to revise the Water Use Analysis Model (WUAM) computer code, such that (a) a choice of units of measurement becomes available, (b) summary nodal outflow arrays are produced, and (c) the variability in evapotranspiration is accounted for in the irrigation module. ii) to incorporate a revised water pricing component into the WUAM (with data provided by IWD) in view of recent research results;to reform industry water use forcasting submodel allowing use provincial growth rates; as well as to include a additional reservoirs in the WUAM database. - To test the impact of various future development scenarios on water supply and use conditions within the Saskatchewan-Nelson river basin; to conceive and test alternative schemes for meeting existing and future electrical energy supply requirements within the Saskachewan River basin using a previously developed capability.

6. Accomplishments/Deliverables:
Milestone 1: Completion of improvement of the graphics module in data handling Completion of model improvements related to (a) water pricing and (b) provincial growth rates. Completion of reservoir database expansion and irrigation module enhancement. Milestone 2: Completion of development, testing of all improvements in WUAM. Completion of model applications including calibration and testing of scenarios. Completion of report production and administration. Milestone 3: Receipt and acceptance of all deliveries. Milestones completed. research results; to reform the industrial water use forcasting sub-model to allow the usage of provincial growth rates; as well as to include additional reservoirs in the WUAM database. iii) to test the impacts of various futures development scenarios on water supply and use conditions within the Saskatchewan-Nelson river basin; to conceive and test alternative schemes for meeting existing and future electrical energy water supply requirements within the Saskatchewan River basin using a previously developed capability.

7. Problems Encountered/Resolution?
Difficulty in incorporating 2nd part of Electrical Energy Water Use Submodel (EEWUS) into model, which links various energy generating systems via stacking routine. Time restriction unabled full consideration to important aspect of energy use. To bring EEWUS to conclusion, changes are needed for future phases

8. Publications/Reports in 87-88 or in Press:
Phase VII, May, 1988.

9. Recommendations:

More work in the area of database expansion of the model to cover all critical water supply regions in all provinces is required in light of model augmentation. Funding of $145K is required each year in order to produce quality product by 1993. More data with regard to groundwater supplies to be entered in WUAM, for it to improve model accuracy in terms of overall water supply; use balances. Inclusion of water quality consideration into model is needed.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Water Supply Constraints OERD Project Number: 25102

2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 139.00 (1.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./ Tech.	Admin.				Sci./ Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	88.00	0.00	41.00	1.0	0.0	3.00

Total Panel K$ (PY): 132.00 (1.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./ Tech.	Admin.				Sci./ Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	1.85	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 1.85 (0.0)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Modelling

OERD Project Number: 41101

2. Manager: E.T. Park
Address: 9th Floor, PVM
Hull, Quebec
K1A 0h3

Department EC/C&P
Phone Number: (819) 997-2308

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	50.00	0.0
PERD As spent	50.00	0.0
EC As spent	12.00	0.0
Other As spent	0.00	0.0
Total As spent	62.00	0.0

4. Contractor(s): a) Acres International Limited
Niagara Falls, Canada

5. 87-88 Objectives: To develop streamflow analysis methodologies for determination of available flow for power generation applicable for feasibility level analyses for ungauged small-scale hydro sites in Ontario.

6. Accomplishments/Deliverables:
Final reports including a manual, computer model and documentation.

7. Problems Encountered/Resolution?
-The study was initiated late (October 1987) due to delayed contractual procedures; however, the work was completed as scheduled.

8. Publications/Reports in 87-88 or in Press:
-The final reports are available. Title? Date ? ect?

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Modelling OERD Project Number: 41101

2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 50.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
3.00	0.00	0.0	0.0	0.0	47.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 50.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	12.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 12.00 (0.0)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Anaerobic Digestion OERD Project Number: 45403

2. Manager: E.R. Hall
Address: Wastewater Technology Centre
P.O. Box 5050
Burlington, Ont., L7R 4A6
Department EC/C&P
Phone Number: (416) 336-4715

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	150.00	0.0
PERD As spent	150.00	0.0
EC As spent	174.80	3.5
Other As spent	52.00	0.0
Total As spent	376.80	3.5

4. Contractor(s): a) L.-A. Cornacchio
Dundas, Ontario
b) Beak Consultants Ltd.
Brampton, Ontario

5. 87-88 Objectives: - Complete sampling and characterization program for Ontario kraft mill bleach plants. - Initiate national characterization toxicant treatability study for wastewaters from TMP and CTMP mills. - Continue process stability predictor verification on pilot scale anaerobic reactor. - Continue provision of technical assistance to industry and OGDs.

6. Accomplishments/Deliverables:
- MacMillan Bloedel demonstration study at Sturgeon Falls, Ontario, was successfully completed - MB has requested approval for full scale installation.
- Industry decisions to install full scale anaerobic treatment at pulp mills in Quesnel B.C. and St. George N.B.
- Joint WTC/Manitoba/Portage La Prairie anaerobic pilot study completed - BVF technology selected for full scale installation.
- WTC study on anaerobic treatment of CTMP and kraft bleach plant wastewaters initiated.
- Industry and provincial government approval obtained for technology transfer seminar on treat of CTMP wastewaters, October, 1988.
- WTC process control studies developed process models and on-line estimators for prediction of process stability.

7. Problems Encountered/Resolution?
-All programs are behind schedule due to high level of outside interest and resulting requests for support. No additional problems encountered.

8. Publications/Reports in 87-88 or in Press:

(1) 1987. Hall, E.R., "Biofilm Reactors in Anaerobic Wastewater Treatment", Biotechnology Advances, 5, 257-269.
(2) 1988. Hall E.R. and L.-A. Cornacchio, "Anaerobic Treatability Testing of Canadian Pulp and Paper Wastewaters", Pulp & Paper Canada, (In the press).
(3) 1988. Hall E.R. and L.-A. Cornacchio, "Anaerobic Treatability Screening Studies of Canadian Pulp & Paper Wastewaters", Wastewater Technology Centre, Burlington, Ontario, Report WTC-BIO-09, March.

9. Recommendations:
-Continue program as proposed.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Anaerobic Digestion OERD Project Number: 45403

2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 150.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
1.90	0.00	0.0	0.0	0.0	144.50	0.00	0.00	0.0	0.0	3.60

Total Panel K$ (PY): 150.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
12.00	15.00	126.7	2.5	0.5	0.00	0.00	21.10	0.5	0.0	0.00

Total EC K$ (PY) = 174.80 (3.5)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
MOSST Biotechnology	52.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 52.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Demonstra'n of Liquid Fuel Produc'n from Sewage Sludge

OERD Project Number: 51202

2. Manager: H.W. Campbell

Address: Wastewater Technology Centre
Burlington, Ontario

Department EC/C&P
Phone Number: (416) 336-4717

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	323.00	0.0
PERD As spent	349.00	0.0
EC As spent	130.60	1.5
Other As spent	0.00	0.0
Total As spent	479.60	1.5

4. Contractor(s): a) Dearborn Environmental Consultants, Mississauga, Ont.
b) Chemical Engineering Research Consultants Ltd. (CERCL) Toronto, Ontario.
c) Petro Sun International, Montreal, Quebec.

5. 87-88 Objectives: -To continue to increase data base on 1 kg/h PDU. - To evaluate 1 tonne/d pilot plant. To access environmental impact of technology.

6. Accomplishments/Deliverables:
(a) Commissioning runs completed on pilot plant.
(b) Acid washing pilot plant for upgrading oil completed and evaluated.
(c) Data base expanded using 1 kg/h PDU.
(d) Oil upgrading options evaluated and preferred option selected.
(e) Preliminary oil combustion studies completed.
(f) Modifications to pilot plant complete. Evaluation in progress.

7. Problems Encountered/Resolution?
-Due to financial difficulties experienced by Petro Sun the licence was returned to the Crown and Environment Canada took over operation of the pilot plant. Negotiations with a potential licencee are in progress.

8. Publications/Reports in 87-88 or in Press:
i)Wastewater Technology Sewage Sludge Liquefaction - Final Report by University of Toronto (CERCL), Aug. 87.
ii)Denitrogenation of WTC Sewage Sludge Oils - Final Report by University of Toronto (CERCL), Mar. 88.
iii)"Conversion of Sludge to Oil: A Novel Approach to Sludge Management" by H.W. Campbell presented at Philadelphia WPCF conference, Oct. 87.
iv)"Status Report on Oil from Sludge" by H.W. Campbell for presentation at EEC Sewage Sludge Treatment and Use Workshop, Sept. 88, In press.

9. Recommendations:
-Project is proceeding well and continued support is warranted.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Demonstra'n of Liquid Fuel Produc'n from Sewage Sludge

OERD Project Number: 51202

2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 323.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./ Tech.	Admin.				Sci./ Auth.	Admin.	
85.50	0.00	0.0	0.0	0.0	261.40	0.00	0.00	0.0	0.0	2.10

Total Panel K$ (PY): 349.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./ Tech.	Admin.				Sci./ Auth.	Admin.	
60.00	2.00	38.4	0.8	0.2	12.00	0.00	18.20	0.5	0.0	0.00

Total EC K$ (PY) = 130.60 (1.5)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Pollution Abatement Tecnologies

OERD Project Number: 57101

2. Manager: R. Scoggins
Address: Ottawa, Ontario
K1A 0H3

Department EC/C&P
Phone Number: (819) 997-1123

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	146.00	1.0
PERD As spent	137.00	1.0
EC As spent	1.00	0.2
Other As spent	35.00	0.0
Total As spent	173.00	1.2

4. Contractor(s): a) Western Research (Calgary) - characterization & environmental significance of LPG/natural gas plant sludges (Phase IIB Study).

5. 87-88 Objectives:
-continued research towards developing a methodology for characterizing and determining the environmental significance of LPG/natural gas processing industry waste sludges which will be distributed to all Canadian Petroleum Association member companies.

6. Accomplishments/Deliverables:
- permanent Environment Canada representation on CPA/ERAC research committee
- the sludge characterization research has demonstrated that the current Provincial hazardous waste leachate protocol (e.g.: Extraction Procedure) is ineffective in measuring the true level of hazard presented by gas plant sludges. The leachate procedure developed by this R&D as an alternative is being considered for use under the Federal Transportation of Dangerous Goods Regulation (1989 Amendments)
- no formal deliverable to be met for the 87/88 fiscal year.

7. Problems Encountered/Resolution?
-The phase IIB study was originally to have been completed by March '88. However, a number of problems (e.g. delay in selection of sample sites, project management problem with primary contractor & sub-contract lab. quality control problem) have delayed the completion of the Phase study by approx. 6 months.

8. Publications/Reports in 87-88 or in Press:

9. Recommendations:
The research will be used in the development of the recommended sludge characterization/environmental methodology for LPG/natural gas processing industry.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Pollution Abatement Tecnologies OERD Project Number: 57101
2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 146.00 (1.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	77.00	6.00	54.00	1.0	0.0	0.00

Total Panel K$ (PY): 137.00 (1.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
1.00	0.00	0.0	0.2	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 1.00 (0.2)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
CPA/ERAC & ARC	35.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 35.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Environmental Implications of Co-Processing

OERD Project Number: 57114

2. Manager: H. Melcer

Address: Wastewater Technology Centre
P.O. Box 5050
Burlington, Ontario, L7R 4A6

Department EC/C&P
Phone Number: (416) 336-4546

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	129.00	1.0
PERD As spent	79.20	1.0
EC As spent	9.00	0.2
Other As spent	0.00	0.0
Total As spent	88.20	1.2

4. Contractor(s): N/A

5. 87-88 Objectives:

-Completion of deliverables listed for 57103 (see no. 8). Assist Canmet (Bells Corners) with development and evaluation of environmental technologies for wastewaters from coal coprocessing operations.

6. Accomplishments/Deliverables:

i) Characterize condensates and solid residues from pilot reactors at Canmet
ii) Evaluate condensate pretreatment with crushed coal.
iii) Evaluate biological treatment of PetroCan/Canmet upgrader condensate.

7. Problems Encountered/Resolution?

-Large coprocessing pilot plant not completed by Canmet and sufficient wastewater was not available for characterization and treatability assessment. The pilot plant is unlikely to be completed in the foreseeable future. This work was halted and funds redeployed.

8. Publications/Reports in 87-88 or in Press:

i) Biological Fluidized Bed Treatment under Dynamic Conditions.
ii) "Nitrogen Control of Complex Industrial Wastewaters", Melcer, H. and S.G. Nutt. Journal of Environmental Engineering, 114(1), 166-178, 1988.
iii) "Dissolved Oxygen Control in a Coupled Fluidized Bed System", Jones, R.M. and H. Melcer. Proced. of 42nd Ann. Purdue Ind. Waste Conf., 541-9, '87.
iv) "Removal of Organic Trace Contaminants during Biological Treatment of Coal Liquefaction Process Condensates", Melcer H. and S.G. Nutt. Presented at International Conference of Physiochemical and Biological Detocification of Hazardous Wastes, Atlantic City, N.J., May, 1988.

9. Recommendations:

-Delayed until Canmet can resolve the option to complete installation.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Environmental Implications of Co-Processing　　OERD Project Number: 57114
2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 129.00 (1.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
18.50	16.70	44.0	1.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 79.20 (1.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.20	0.00	4.4	0.1	0.0	0.00	0.00	4.40	0.1	0.0	0.00

Total EC K$ (PY) = 9.00 (0.2)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Impacts of NLF in Motor Vehicles

OERD Project Number: 57115

2. Manager: C. Wachmann/C.B. Prakash
Address: Industrial Programs Branch
13th Floor, PVM
Hull, Quebec

Department EC/C&P
Phone Number: (819) 997-1614

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	20.00	0.0
PERD As spent	34.00	0.0
EC As spent	15.00	0.0
Other As spent	5.00	0.0
Total As spent	54.00	0.0

4. Contractor(s): N/A

5. 87-88 Objectives:
- Conduct literature review of emissions from light-duty vehicles using alcohol-gasoline blends.
- Develop emissions testing program/procedures.
- Initiate limited aldehyde and alcohol emissions testing.

6. Accomplishments/Deliverables:
- Developed a portable instrument calibration system for vehicle emissions characterization.
- Established quality control/quality assurance procedures for emissions testing from alcohol-gasoline blends and methanol.
- Significantly enhanced cooperation with Energy, Mines & Resources, Transport Canada and the United States Environmental Protection Agency.

7. Problems Encountered/Resolution?
   - None.

8. Publications/Reports in 87-88 or in Press:
-"Emissions from Motor Vehicles using Low Level Alcohol-Gasoline Blends: A Preliminary Assessment Focusing on Aldehydes and Alcohols".

9. Recommendations:
-The program is progressing well and should be continued.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Impacts of NLF in Motor Vehicles — OERD Project Number: 57115
2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 20.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
34.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 34.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
15.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 15.00 (0.0)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
Transport Canada	5.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 5.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Underground Tank Compatibility with NLF — OERD Project Number: 57116

2. Manager: K. Karr — Department EC/C&P
Address: Industrial Programs Branch — Phone Number: (819) 953-1125
13th Floor, PVM
Hull, Quebec

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	15.00	0.0
PERD As spent	15.00	0.0
EC As spent	0.00	0.1
Other As spent	0.00	0.0
Total As spent	15.00	0.1

4. Contractor(s): a) Underwriters Labs of Canada
Rexdale, Ontario

5. 87-88 Objectives: Complete protocol for testing compatibility of FRP resins in different fuel type.

6. Accomplishments/Deliverables:
- A test protocol was developed that enables FRP samples to be immersed in different types of fuels, including oxigenated fuels, to determine the chemical compatibility.
- Samples were prepared and immersed in fuels. The samples will be immersed for two years and periodically tested.

7. Problems Encountered/Resolution?
- None.

8. Publications/Reports in 87-88 or in Press:

9. Recommendations:
-Results will not be available until early 1990, when testing has completed.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Underground Tank Compatibility with NLF — OERD Project Number: 57116
2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 15.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
2.50	0.00	0.0	0.0	0.0	12.50	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 15.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.1	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 0.00 (0.1)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Wave Turbulence Interaction

OERD Project Number: 62123

2. Manager: M. Donelan
Address: P.O. Box 5050
Burlington, Ontario
L7R 4A6

Department EC/C&P
Phone Number: (416) 336-4879

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	0.00	0.0
PERD As spent	65.00	0.0
EC As spent	260.50	4.7
Other As spent	0.00	0.0
Total As spent	325.50	4.7

4. Contractor(s): N/A

5. 87-88 Objectives: i) To examine the spectral distribution of dissipation in a white capping sea. ii) To measure the velocity field beneath breaking waves. To explore the statistical properties of the vertical and horizontal velocity components in the context of expected forces on marine structures for design purposes. iii) To determine the vertical distribution of turbulent energy due to wave breaking & wind stress.

6. Accomplishments/Deliverables:
-The final phase of the (3-year) field program was successfully carried out. The complimentary measurements of mean flow and turbulence using three different velocity sensing principles (drag sphere current meters, acoustic time-of-flight current meters and laser Doppler current meters) were recorded for about 193 runs or about 280 hours of data. A thorough laboratory calibration procedure was carried through for the drag spheres and acoustic current meters, particularly to determine the effect of wave orbital velocities on the estimates of mean currents.
-The analysis of the data from all three field programs (1985, '86 and '87) is now fully underway. The first task will be a field intercomparison of the different instruments.
-In order to fully understand the velocity measurements, one needs detailed information on the wave directional spectra. This we obtained via an array of 6 wave gauges arranged in a "centered pentagon". The code for the analysis of these data via a maximum likelihood scheme has now been checked and this analysis is now going into production also.
-We expect (in the final year of this project) to be able to resolve many issues related to the dynamics of the upper mixed layer particularly when covered by breaking waves.

7. Problems Encountered/Resolution?
-There was some difficulty reconciling mean flow measurements from the drag

spheres and the acoustic current meters. We were able to resolve these by means of the laboratory tests mentioned above.

8. Publications/Reports in 87-88 or in Press:

-"The WAVES Programme on the CCIW Research Tower" by I.K. Tsanis and M.A. Donelan - NWRI Internal Report.

9. Recommendations:

-To continue funding for 89/90 to take advantage of this unprecedented data set. Additional funding is needed to hold workshop.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Wave Turbulence Interaction OERD Project Number: 62123

2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 0.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
65.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 65.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
10.00	7.50	243.0	4.7	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 260.50 (4.7)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Shoaling Waves OERD Project Number: 62124

2. Manager: M. Donelan Department EC/C&P
Address: P.O. Box 5050 Phone Number: (416) 336-4870
Burlington, Ontario,
L7R 4A6

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	24.00	0.0
PERD As spent	50.00	0.0
EC As spent	132.50	2.3
Other As spent	25.00	0.0
Total As spent	207.50	2.3

4. Contractor(s):

5. 87-88 Objectives:
(a) To devise a theoretical procedure to obtain the joint distribution of wave heights and periods in shoaling water.
(b) To test the procedure from (a) using results from laboratory and field experiments.

6. Accomplishments/Deliverables:
A field experiment was conducted at the western end of Lake Ontario in collaboration with the work being done under PERD 62123. The experiment was highly successful and the data gathering period ended with strong easterly winds producing waves with significant heights exceeding 2.0 metres in deep water. As these waves propagated from the large WAVES tower they began to shoal strongly just inside of the outermost temporary tower. We expect that this and other lesser storms will yield an excellent data base for extending our knowledge of the statistics of shoaling waves.

7. Problems Encountered/Resolution?
-Early difficulties with the shore-to-tower link appeared to be insuperable. Arrangements were made to record on each tower by an electrical command.
-Later on the problem was solved enabling us to establish the shore-to-tower link and to get continuous data recorded on shore.

8. Publications/Reports in 87-88 or in Press:
-"Shoaling Waves Programme in Lake Ontario" by I.K. Tsanis, M.A. Donelan, R.J. Desrosiers, F.E. Roy and D.C. Beesley. NWRI report.

9. Recommendations:
-Funding should be increased in 89/90 to $55K (from $35K) to cover costs of beach modification, experimental supplies, ect.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-38

FINANCIAL SUMMARY

1. Title: Shoaling Waves OERD Project Number: 62124

2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 24.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
50.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 50.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contrib-ution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	13.50	119.0	2.3	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 132.50 (2.3)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
COGLA	25.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 25.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Wave Forces on Undersea Pipelines in Open Trenches

OERD Project Number: 62230

2. Manager: M. Skafel
Address: P.O. Box 5050
Burlington, Ontario,
L7R 4A5

Department EC/C&P
Phone Number: (416) 336-4736

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	3.00	0.0
PERD As spent	3.00	0.0
EC As spent	10.00	0.2
Other As spent	0.00	0.0
Total As spent	13.00	0.2

4. Contractor(s):

5. 87-88 Objectives:
To conduct a series of experiments aimed at determining the relationships between forces and hydrodynamic parameters for submarine pipelines in trenches.

6. Accomplishments/Deliverables:
- None.

7. Problems Encountered/Resolution?
-The instrumentation problems encountered last year continued to affect this study. Full testing will commence in late April.

8. Publications/Reports in 87-88 or in Press:
- None.

9. Recommendations:
-Final implementation of the instrument pipe will be attempted in 88/89 & experiments conducted. If implemen'n remains elusive, work should be suspended.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Wave Forces on Undersea Pipelines in Open Trenches OERD Project Number: 62230
2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 3.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
3.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY): 3.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	10.0	0.2	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 10.00 (0.2)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Remote Sensing-Chronic Oil Discharges — OERD Project Number: 67206

2. Manager: R. Percy — Department EC/C&P

Address: 45 Alderney Drive
Dartmouth, N.S.
B2Y 2N6

Phone Number: (902) 426-2576

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	35.00	0.0
PERD As spent	34.40	0.0
EC As spent	0.00	0.0
Other As spent	0.00	0.0
Total As spent	34.40	0.0

4. Contractor(s): Seakem Oceanography, Dartmouth, N.S. with subcontract to Wright Instruments, USA

5. 87-88 Objectives:
Modify Wright and Wright oil film monitor and re-test system on drilling rig.

6. Accomplishments/Deliverables:
- Steering Committee, comprised of Environment Canada and ESSO Resources Ltd., developed terms of reference for continuation of project.
- Contract let October, 1987.
- Modifications to sensor completed February, 1988; modifications significantly improved sensitivity.
- Rig test completed March, 1988.
- Contract let March, 1988 to prepare brochure summarizing 5-year remote sensing project.

7. Problems Encountered/Resolution?
- None.

8. Publications/Reports in 87-88 or in Press:
- Draft final report received march, 1988; following review by steering committee, report will be printed in same EE series as all previous reports.
- A six page brochure summarizing the Remote Sensing Project, was published.

9. Recommendations:
-With the completion of the project, it is recommended that the project reports continue to be widely ditributed.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Remote Sensing-Chronic Oil Discharges OERD Project Number: 67206
2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 35.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
3.60	0.00	0.0	0.0	0.0	25.00	5.00	0.00	0.0	0.0	0.80

Total Panel K$ (PY): 34.40 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 0.00 (0.0)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Integrated Hydrocarbon Monitoring — OERD Project Number: 67237

2. Manager: R. Percy — Department EC/C&P

Address: 45 Alderney Drive
Dartmouth, N.S.
B2Y 2N6

Phone Number: (902) 426-2576

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	98.00	0.0
PERD As spent	102.00	0.0
EC As spent	1.00	0.2
Other As spent	2.00	0.2
Total As spent	105.00	0.4

4. Contractor(s): a) Barringer Resources ltd.
Toronto, Ont.

5. 87-88 Objectives:

-Complete the design and fabrication of gated diode array spectrometer (GDAS) which will permit the detection and quantification of hydrocarbons (and biological materials) on the sea surface and at specific depths within the water column.

6. Accomplishments/Deliverables:

- Steering Committee, comprised of Environmental Protection, Inland Waters/Lands, ESSO Resources Ltd. and Canada Centre for Remote Sensing (CCRS), was formed to develop terms of reference and to oversee contract;
- Loan agreement developed to allow Environment Canada to utilize hardware purchased by CCRS in finalizing development of hydrocarbon monitor;
- System completed to lab test stage

7. Problems Encountered/Resolution?

-Initial difficulty in obtaining some hardware off the shelf to meet high standards necessitated the manufacture of parts in-house. This led to some delays and extra costs. Extra costs were covered by the contractor who sees excellent broad commercial potential of the monitoring system being developed.

8. Publications/Reports in 87-88 or in Press:

- Monthly reports prepared along with summary report.

Title ? Date? Ect?

9. Recommendations:

-There is a requirement to field-test the integrated hydrocarbon monitor during 1988/89. A proposal to continue this project has been prepared.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Integrated Hydrocarbon Monitoring OERD Project Number: 67237
2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 98.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.20	0.00	0.0	0.0	0.0	95.80	3.00	0.00	0.0	0.0	3.00

Total Panel K$ (PY): 102.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
1.00	0.00	0.0	0.2	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 1.00 (0.2)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
CCRS & ESSO Resources	2.00	0.0	0.0	0.00	0.2

Total Other K$ (PY) = 2.00 (0.2)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Condensate Effects on Commercial Species

OERD Project Number: 67238

2. Manager: Roger Percy

Address: 45 Alderney Drive
Dartmouth, N.S.
B2Y 2N6

Department EC/C&P
Phone Number: (902) 426-2576

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	20.00	0.0
PERD As spent	28.00	0.0
EC As spent	0.00	0.0
Other As spent	0.00	0.0
Total As spent	28.00	0.0

4. Contractor(s): Martec Ltd. (Halifax, N.S.) with subcontracts to the Canadian Institute of Fisheries Technology (Technical University of N.S.) and Seakem Oceanography.

5. 87-88 Objectives:

Begin the examination of the toxicity and tainting of a commercial species exposed to water soluble fractions of Scotian Shelf condensates. Characterization of condensate by appropriate analytical methods to ensure proper interpretation of the toxicity and tainting data.

6. Accomplishments/Deliverables:

- Steering committee formed, comprising Texaco Canada, Mobil Oil Ltd., Department of Fisheries and Oceans and Environment Canada.
- Study terms of reference and detailed test protocol were developed.
- The contract was awarded November, 1987.
- Work completed to date includes: chemical characterization of condensate; toxicity testing; set-up exposure system; examination of condensate losses and stability in the exposure system; examination of hydrocarbon recoveries with extraction techniques used; first range finding taste panel trials for evaluation of taint.

7. Problems Encountered/Resolution?

- None.

8. Publications/Reports in 87-88 or in Press:

-Draft final report for Phase I received 31 March 1988.
Title ? Date ? Ect. ?

9. Recommendations:

-This project has already provided valuable insights into the tainting potential of gas condensates and suggests that additional work is required.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Condensate Effects on Commercial Species — OERD Project Number: 67238
2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 20.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	26.00	0.00	0.00	0.0	0.0	2.00

Total Panel K$ (PY): 28.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 0.00 (0.0)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Organic Pollutants from Flare Stacks
OERD Project Number: 67239

2. Manager: V. Marwaha/P.J. Blackall
Department EC/C&P
Address: Environment Canada
4999-98 Avenue
Edmonton, Alberta
Phone Number: (403) 468-8030

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	100.00	0.0
PERD As spent	41.40	1.0
EC As spent	10.50	0.3
Other As spent	133.60	0.0
Total As spent	185.50	1.3

4. Contractor(s): a) Titan Projects Ltd. Consulting Engineers
212-7710 - 5th Street S.E.
Calgary, Alberta T2H 2L9
b) Atomic Energy of Canada Limited (AECL)
Chalk River Nuclear Laboratories
Chalk River, Ontario
K0J 1J0

5. 87-88 Objectives: 1) To conduct a survey of flaring practices in Alberta.
2) Set up catalyst test facility and analytical equipment by March 31, 1988.
3) Final report on catalysts due November, 1988.

6. Accomplishments/Deliverables:
-Data obtained from 318 flare facilities in Alberta.
-Report completing survey results completed.
-Significant problems in industrial flaring in Alberta identified.
-Data will be widely used by IPAC, CPA, ERCB, and provincial regulatory agencies.
-The catalyst test facility and analytical equipment were in place as planned by March 23, 1988.
-Significant cooperation and cost sharing achieved among federal, provincial and industrial partners.

7. Problems Encountered/Resolution?
-Developing joint programs with Alberta Environment.

8. Publications/Reports in 87-88 or in Press:
-draft report completed. title ? date ? ect. ?

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Organic Pollutants from Flare Stacks   OERD Project Number: 67239
2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY):   100.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	1.0	0.0	41.40	0.00	0.00	0.0	0.0	0.00

Total Panel K$ (PY):   41.40 (1.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.50	0.00	0.0	0.0	0.0	0.00	0.00	10.00	0.3	0.0	0.00

Total EC K$ (PY) =   10.50 (0.3)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
ERCB,AECL,CGPA,CPA,Alb.Env.	75.00	0.0	0.0	58.60	0.0

Total Other K$ (PY) =   133.60 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Produced Water Alternatives OERD Project Number: 67245

2. Manager: J.W. Schidt Department EC/C&P
Address: Wastewater Technology Centre Phone Number: (416) 336-4541
Burlington, Ont.

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	78.00	1.0
PERD As spent	26.60	0.0
EC As spent	14.90	0.3
Other As spent	0.00	0.0
Total As spent	41.50	0.3

4. Contractor(s): Ian Martin and Associates, Hamilton, Ontario

5. 87-88 Objectives: a)To evaluate alternative oil and suspended solids removal technologies suitable for treating prduced water from offshore oil production/ drilling technologies, and to develop/demonstrate the most cost-effective technology.

6. Accomplishments/Deliverables:
Preparation of a state-of-the-art report focussing on produced water treatment was initiated and is undergoing technical review.

Discussion with and visits to offshore oil producers in the U.S. Gulf Coast, United Kingdom hydrocyclones and the need for proper monitoring of oil and grease, as is presently the case, were identified. Questionnaires circulated to offshore oil producers in the U.K. and Norway have been received. A site visit was made to British Petroleum Research in the U.K. to initiate discussions on the use of coalescers and other oil removal technologies. A visit to Dr. Thew of the University of Southampton was also made to discuss the use of hydrocyclones for oil removal from produced water. Based on the above, a more detailed work plan for FY 1988/89 was developed.

7. Problems Encountered/Resolution?
None.

8. Publications/Reports in 87-88 or in Press:
Draft of "State-of-the-art of Treatment Technology", under review.

9. Recommendations:
Technology development should focus on iduced gas flotation, hydrocyclone, and coalescers as well as oil and grease measurement techniques.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Produced Water Alternatives OERD Project Number: 67245

2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 78.00 (1.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
9.70	0.00	0.0	0.0	0.0	16.00	0.00	0.00	0.0	0.0	0.90

Total Panel K$ (PY): 26.60 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
2.00	0.00	12.9	0.3	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 14.90 (0.3)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART I
EC ANNUAL PROJECT REPORT
1987-88

1. Title: Biodegradability of Base Oils OERD Project Number: 67246

2. Manager: J. Osborne Department EC/C&P
Address: P.O. Box 5037 Phone Number: (709) 772-5488
St. John's Nfld
A1C 5V3

3. Resources Expended (87-88):

	K$	PY
PERD Proposed	50.00	0.0
PERD As spent	55.00	0.0
EC As spent	0.00	0.0
Other As spent	0.00	0.0
Total As spent	55.00	0.0

4. Contractor(s): a) CBRI
P.O. Box 2010
9865 W. Saanich Rd.
Sydney, BC V8L 3S3

5. 87-88 Objectives: 1. Assessment of two current protocols for use in marine tests.

6. Accomplishments/Deliverables:
-The trickling filter test was found to be unsuitable for a 28 day biodegradability protocol.
-The shake flask test appears to be promising.
-Accurate results require at least three replicates.
-Oil degrading bacteria from the Beaufort Sea were cultured and used in the first series of tests on the continuous dilution test.

7. Problems Encountered/Resolution?
N/A

8. Publications/Reports in 87-88 or in Press:
-Gillam, A.H., Severn, S.R.T. and Engelhardt, F.R. :"Review of Biodegradability Test Protocols for Drilling Fluid Base Oils.", presented at the International Conference on Drilling Fluids, April '88 Calgary.

9. Recommendations:
-Project proceed with funding as defined in MYOP.

INTERDEPARTMENTAL PANEL ON ENERGY R&D (PERD) PART II
EC ANNUAL PROJECT REPORT
1987-88

FINANCIAL SUMMARY

1. Title: Biodegradability of Base Oils OERD Project Number: 67246

2. Department/Service: EC/C&P
3. Proposed PERD Resources K$ (PY): 50.00 (0.0)
4. Resources Expended K$ (PY):

(i) Panel Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
3.00	0.00	0.0	0.0	0.0	50.00	0.00	0.00	0.0	0.0	2.00

Total Panel K$ (PY): 55.00 (0.0)

(ii) EC Resources

Intramural					Extramural					DSS
O&M	Capital	Sal.&	(PY)		Contract	Contribution	Sal.& Ben.	(PY)		Fees Paid
			Sci./Tech.	Admin.				Sci./Auth.	Admin.	
0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.00

Total EC K$ (PY) = 0.00 (0.0)

(iii) Other Resources (i.e. DSS UP Fund, industry, provincial, etc.)

Source	O&M	Capital	Sal.& Ben.	Contribution	PY
	0.00	0.0	0.0	0.00	0.0

Total Other K$ (PY) = 0.00 (0.0)